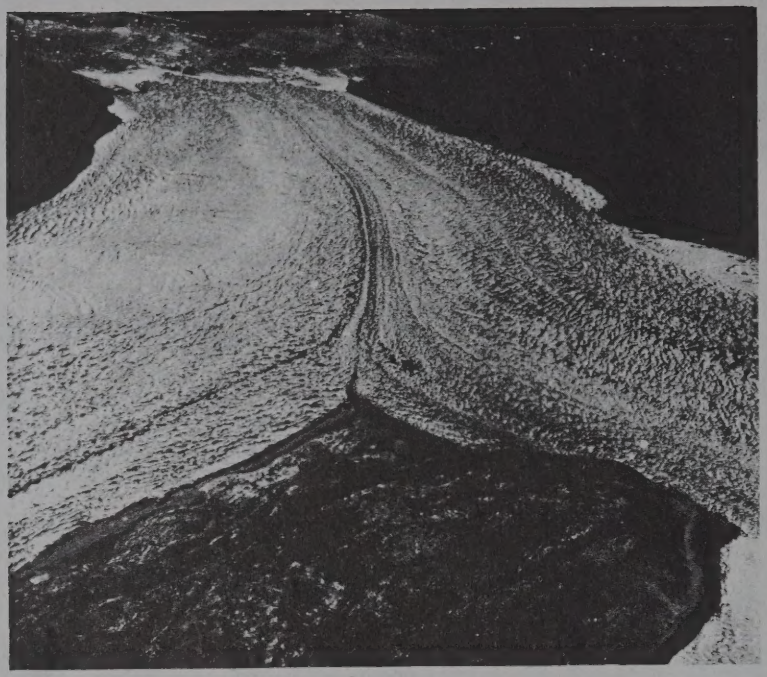
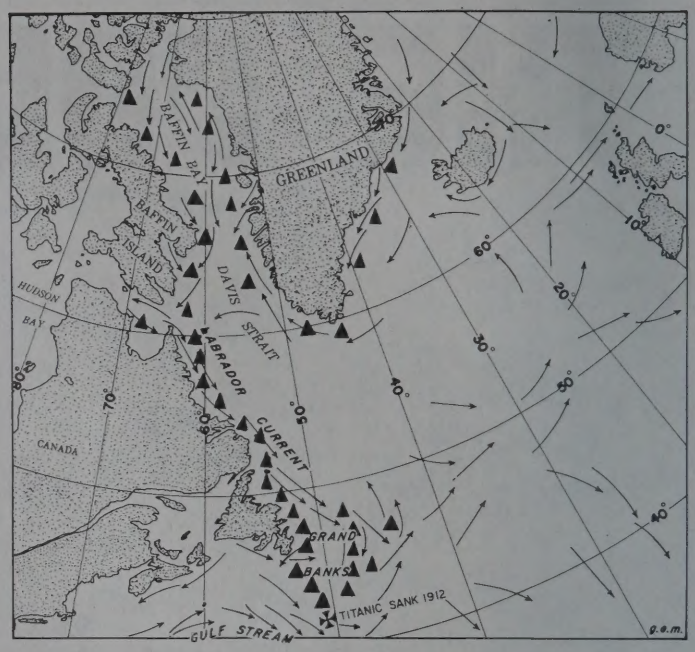
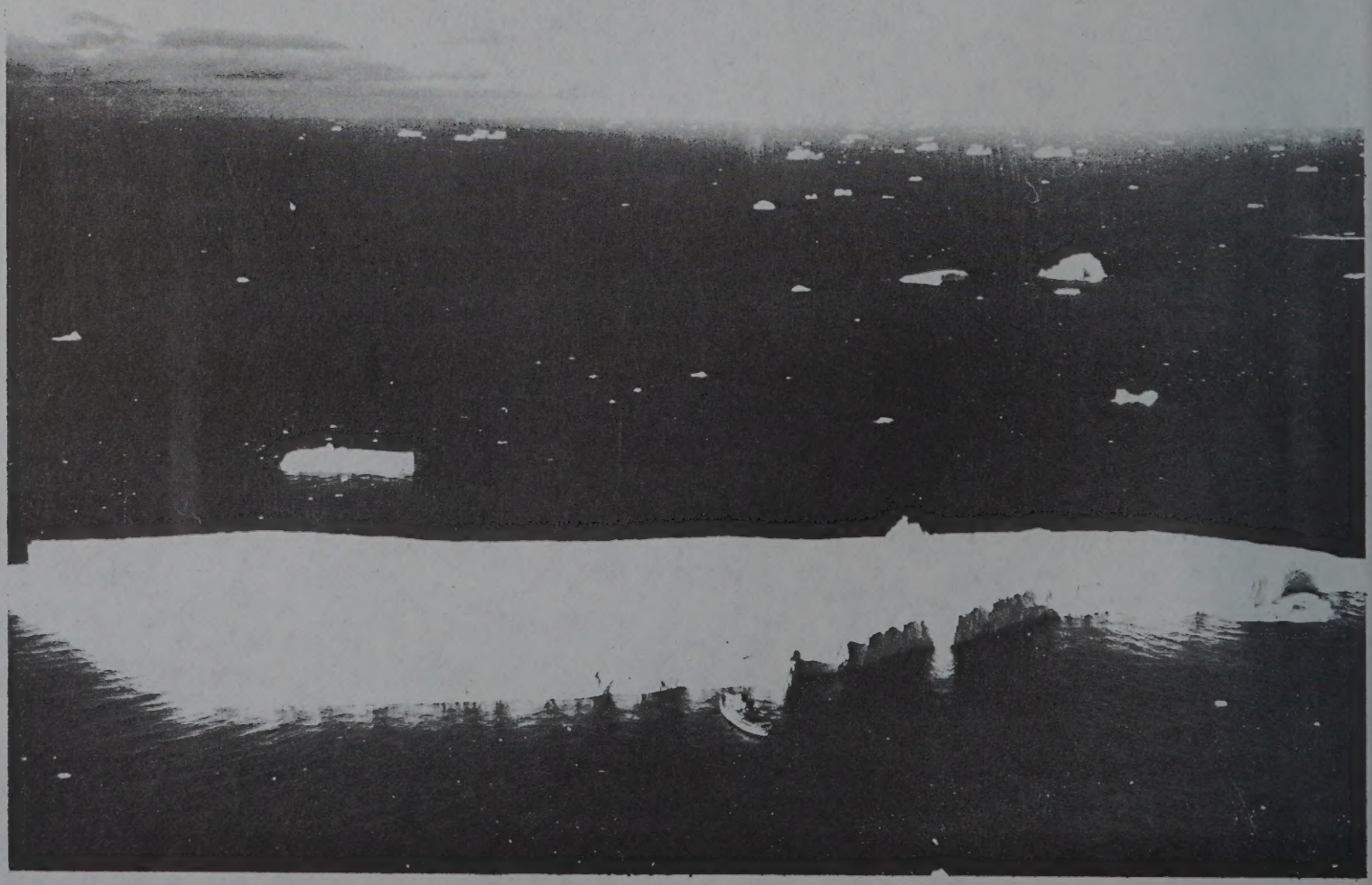
THE POLAR TIMES



Two Greenland glaciers unite to push their way to a distant fjord where they will deposit their quota of icebergs.



It is estimated that 7,500 sizable bergs break off from the west Greenland glaciers each year, an average of 400 of which drift south of latitude 48° N. (Newfoundland) and approximately 35 south of latitude 43° N.



The Polar Times

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No. 69 *DECEMBER 1969*

Fossil Called Proof Southern Continents Were Joined

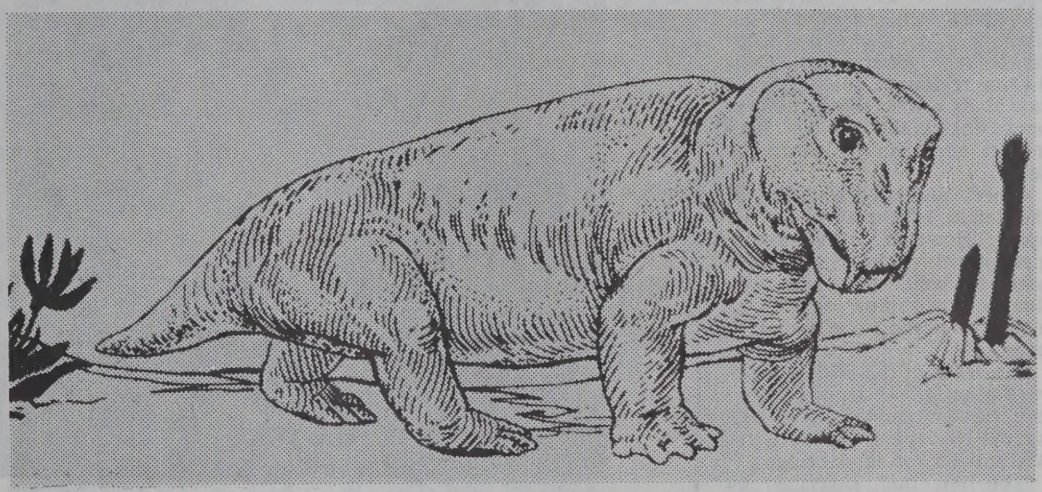
By WALTER SULLIVAN
The New York Times

Dec. 6

The discovery in mountains near the South Pole of the fossil remains of a reptilian counterpart of the hippopotamus that lived, as well, in Africa has established "beyond further question" the former joining of all the southern continents, according to a leading authority on the subject.

The key discovery was made Thursday and reported in a message to the National Science Foundation in Washington by Dr. Laurence M. Gould, scientific leader of Adm. Richard E. Byrd's first expedition to Antarctica in 1928.

Dr. Gould and a fellow geologist, Dr. Grover Murray, president of Texas Technological University, visited the site ofter the discovery, and Dr. Gould said they both considered the find "not only the most important fossil ever found in Antarctica but one of the truly great fossil finds of all time."



A Lystrosaurus, Triassic creature of the type whose fossil remains were found by officials of National Science Board. Picture is from Edwin H. Colbert's "The Age of Reptiles."

Dr. Gould and Dr. Murray are members of the National Science Board, which oversees the National Science Foundation.

The fossil was found in the first bed of reptilian and amphibian fossils discovered on the Antarctica continent.

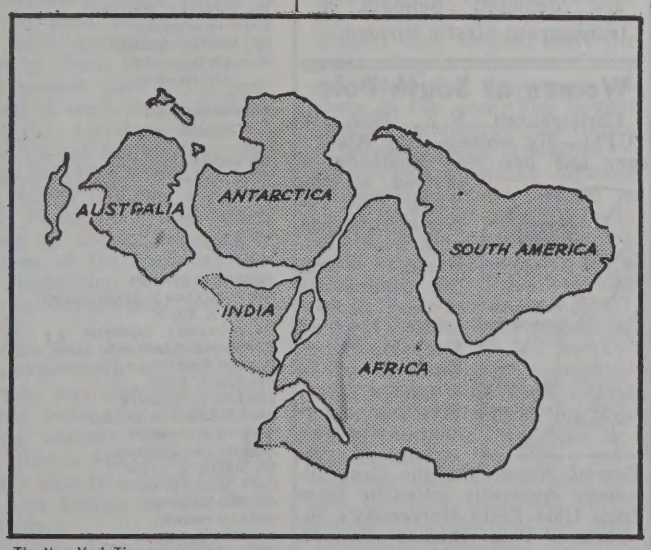
The deposit, apparently an old stream bed, was found a few weeks ago in the Alexandra Range, flanking the Beardmore Glacier on the west. The Beardmore was the route British explorers used in their first attempts to reach the South Pole.

Two years ago, a single fossil fragment was found some 100 miles away in mountains east of the glacier. It was identified as being from a large, salamander-like amphibian that also lived on nearby continents. This was the first fossil hint of a former link between Antarctica and neighboring land masses.

Ever since coal deposits rich in the remains of large trees were found along the Beardmore Glacier, geologists have speculated about why Antarctica was once warm.

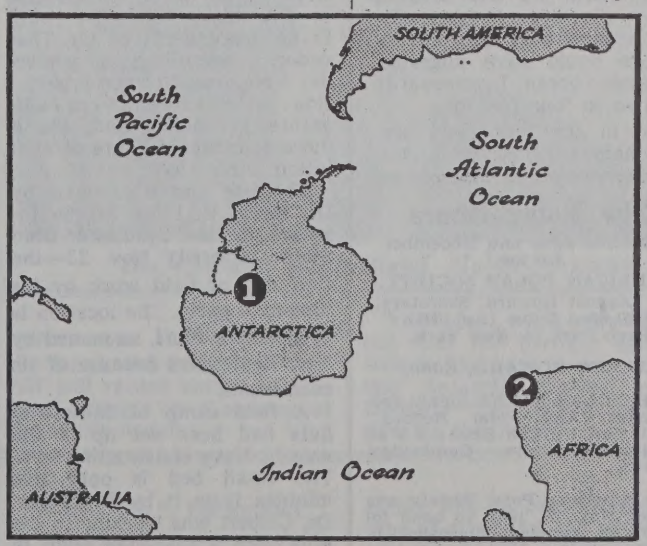
One explanation was continental drift—Antarctica was once closer to the equator and drifted to its present position at a speed of a few inches a year.

A striking similarity between the fossil Antarctica vegetation



The New York Times

Above map indicates manner in which southern continents were thought to have fitted together hundreds of millions of years ago in a land mass. Scientists later termed the land mass Gondwanaland after a region of India.



Dec. 6, 1969

Present relative location of southern continents is indicated above. Fossils of hippo-like reptile discovered Thursday at (1) in Antarctica turned out to be identical with those that were previously found at (2) in South Africa.

and that from India, South Africa, Australia and South America persuaded a number of scientists that those lands must have been joined during the Permian Period, some 250 million years ago.

The Triassic Period, from which the newly found fossil bed dates, followed the Permian.

To explain the close relationship between the Permian vegetation of India and Africa, geologists conjured up a hypothetical land mass called Gondwanaland (from the Gondwana region of India). Some saw it as a lost continent that once linked the various land masses and then sank into the sea.

Others suggested a joining of the lands before they drifted apart. However, most geologists, until recently, found it hard to believethat the continents could plow their way along the ocean floor like giant barges.

The seeds of the "Gondwana" vegetation, they argued, could have been carried over the oceans by various means without a need for land bridges.

The new find, described by Dr. Gould as "a key index fossil," has been identfied by Dr. Edwin H. Colbert of the American Museum of Natural History here. Dr. Colbert, a leading authority on fossils of that period, was with the field party that made the discovery.

The find was a partial skull of Lystrosaurus, considered an index fossil because it occurs in great numbers in some South African locations and has frequently been used to establish the period of a particular deposit there and in Asia.

The skull was unusual in that nostrils and eyes were high on the head, presumably so the animal could see and breathe while wallowing. It is considered inconceivable that such a creature could have migrated across open ocean. Lystrosaurus was two to four feet long.

Also in the fossil bed are the remains of Thecodonts (ancestors of the dinosaurs) and Labyrinthodonts. A jaw fragment of the latter was found in December, 1967. The only living descendents of the Thecodonts, according to yesterday's National Science Foundation announcement, are alligators, crocodiles and, via a more roundabout route of evolution, birds.

The site was discovered by Dr. David H. Elliot of the Institute of Polar Studies at Ohio State University Nov. 23—the first day of field work by his nine-man party. The location is at Coalsack Bluff, so named by New Zealanders because of its coal seams.

A field camp of Jamesway huts had been set up in the area by Navy construction men. The fossil bed is only five minutes from it by helicopter. Dr. Colbert was working in the area with a four-man team in the hopes of finding more vertebrate fossils in addition to the single jaw fragment of 1967.

The Polar Times

Published June and December by the AMERICAN POLAR SOCIETY, August Howard, Secretary, 98-20 62nd Drive (Apt. 7H), Rego Park 74, New York.

AUGUST HOWARD, Editor

THE POLAR TIMES highly recommends "The Polar Record," published by the Scott Polar Research Institute, Cambridge, England.

The American Polar Society was founded Nov. 29, 1934, to band together all persons interested in polar exploration. Membership dues are one dollar a year, which entitles members to receive THE POLAR TIMES twice a year.

Back issues are 50 cents each.

Antarctic Explorer Honored

Capt. Finn Ronne, wife Jackie and 6-foot globe.

WASHINGTON, Oct. 22

A 6-foot lighted globe showing mouhtain heights and ocean depths was dedicated yesterday at the National Archives to honor the man who discovered the world's last unexplored coastline.

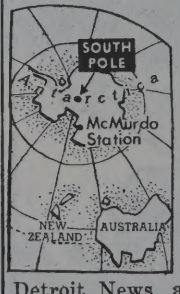
Retired Navy Capt. Finn Ronne was there, with his wife Edith (Jackie), to accept the globe for the American public.

More than 100 people crowded into the exhibition hall to see the $12,000 globe donated by Dr. Talbert Abrams, of Abrams Aerial Survey Corp. Turning once every three minutes, the globe has a horizontal scale of 103 miles to the inch and a vertical scale of one centimeter to the mile so that a 13,000-foot mountain appears an inch high. Ocean depths are depicted beneath a transparent plastic surface.

After acknowledging a plaque presented by Robert L. Kunzig, General Services Administrator, the Norwegian-born explorer greeted old friends, among whom was Evelyn Nef of Washington, the widow of Vilhjalmur Stefansson, one of the great names in polar exploration.

Women at South Pole

Christchurch, N. Z., Nov. 12 (UPI)—Six women—five Americans and one New Zealander—arrived at the South Pole today arm in arm with Rear Adm. David Welch, the commander of the U.S. Antarctic Naval Support Force. The American women were Mrs. Jean Pearson, science writer of the Detroit News, and the first all-woman Antarctic scientific team from Ohio State University's Institute of Polar Studies—Lois M. Jones, Mrs. Eileen R. McSaveney, Mrs. Kay L. Lindsay and Terry Lee Tickhill. The New Zealander is Mrs. Pam Young, whose scientist husband is studying penguins.



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Antarctic, a No-Woman's Land, to Get 6 Females

By WALTER SULLIVAN

The New York Times

Oct. 1

The largest male sanctuary remaining on this planet is about to succumb to an incursion of females.

The National Science Foundation, after years of resistance, has finally agreed to let six women work out of American bases in the Antarctic during the season of exploration about to begin there.

Four of the women make up a team of scientists that was formed at the Institute of Polar Studies of Ohio State University. They will study one of the snow-free "dry valleys" across McMurdo Sound from the main American base.

Another of the women is the wife of Dr. Dietland Müller-Schwartze, a biologist at Utah State University. She will go as his assistant. They plan to live and work at the emperor penguine rookery at Cape Crozier near McMurdo.

The sixth female visitor will be Jean Pearson, a reporter for The Detroit News, who is president of the National association of Science Writers.

Although female researchers in past years have sought, through the National Science Foundation, to work in the Antarctic, they have been turned away on the ground that the all-male base camps had no facilities for women. American women were particularly irked because women from the Soviet Union had been allowed to work at their country's Antarctic bases.

The first human beings known to have set foot on the great continent at the bottom of the world were Norwegians, who landed at Cape Adare in 1895. By now, thousands have gone there, manning bases operated by about 10 countries.

But women have never been allowed to work at the stations set up for American scientists by the United States Navy during the last 13 years. This program, which includes a station at the South Pole, was originally set up, under the scientific direction of the National Science Foundation, for the International Geophysical Year of 1957-58.

So far as is known, the first woman to tread the Antartic continent was Caroline Mikkelsen, the wife of a Norwegian whaling captain. On Feb. 20, 1935, Klarius Mikkelsen landed with his wife in a snow-free region now known as the Vestfold Hills.

In 1947, Finn Ronne, an American Naval Reserve officer, set up a base on Stonington Island, where his wife and the wife of the expedition's aviator became the first women to live through the long winter night in Antarctica.

From left are, Mrs. Eileen R. McSaveney, Miss Terry Lee Tickhill, Mrs. Kay L. Lindsay and Dr. Lois M. Jones. They form the Ohio State University team for Antarctic visit.

Considerable tension developed in the camp and published accounts of the experience were not encouraging to those who contemplated such an arrangement on future expeditions.

In the Artic, a precedent was set at the Naval Research Laboratory at Point Barrow on the northern tip of Alaska. Women have worked there for years despite spartan living conditions. But they were not alone in the area. The largest Eskimo community in the North, at Barrow Village, is nearby.

Two Pan American Airways stewardesses were aboard a plane that flew into McMurdo Sound in the Antarctic a few years ago. They stayed only a few hours and then flew out again.

The female team organized at Ohio State is led by Dr. Lois M. Jones, who recently moved from Ohio State to the University of Georgia. She will study weathering and salt accumulation in the valley surrounding Lake Vanda. Mrs. Eileen R. McSaveney will study the glacial history of the area in the lake's beaches.

Mrs. Kay L. Lindsay, an entomologist, will study the interaction between the barren environment and the meager life forms, and Terry Lee Tickhill will record daily and seasonal changes in chemistry of the lake's water.

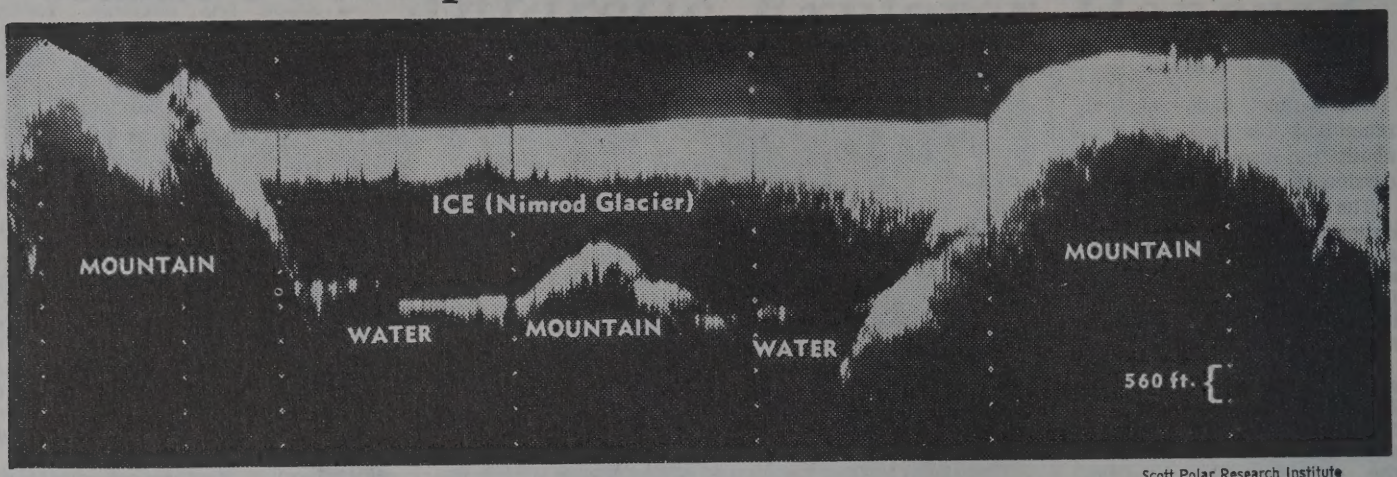
Drs. Christine and Dietland Muller-Schwarze

Yesterday, when news leaked out that the barriers against women had been broken down, one Antarctic veteran commented: "The only place left now is the moon"

Whaleship to Be Rebuilt

SANDEFJORD, Norway (UPI) —The former Norweigian whaling factory ship Thorshavet will be rebuilt into a fish processing ship to catch a special type of a herring, the pilchard, off the South African coast. The pilchard is used as raw material for fishmeal and fish oil.

Radar to Help Trace Profile of Antarctica



Scott Polar Research Institute

Airborne radar produced this profile of surface and what lies under it across mouth of Nimrod Glacier, Antarctica

By WALTER SULLIVAN
The New York Times

CAMBRIDGE, England, Oct. 29 —In a series of 20 or more flights during the coming months, British scientists hope that, figuratively, they can peel back a large part of Antarctica's ice covering, disclosing the continent that lies beneath.

They will use an airborne radar, mounted on a C-130 Hercules transport of the United States Navy based at McMurdo Sound. The equipment has already penetrated more than 14,800 feet of ice, recording a profile of the mountains and valleys underneath.

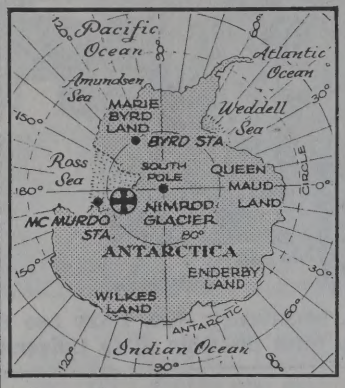
It will be the first large-scale attempt at radar charting of the ice-buried continent surrounding the South Pole. The technique has been developed in recent years at the expense of three lives, one Russian and three British, lost when vehicles broke through snow bridges and fell down Antarctic crevasses.

Altogether, at the request of the National Science Foundation in Washington, scientists at the Scott Polar Research Institute here have charted flight paths totaling 500 hours (roughly 50 missions).

However the need to install a new radar antenna on the Hercules has delayed delivery of the plane to Antarctica. Hence the number of missions that can be flown during the coming southern summer, which coincides with the northern winter, will probably be considerably less.

The radar exploits the fact that radio waves of suitable frequency can penetrate ice (unless partially melted and hence electrically conducting). Ice-sounding radars have been developed in the United States, the Soviet Union and at the Scott Polar Research Institute.

When in 1964 the Russians



The New York Times Nov. 7, 1969
Site of the glacier (cross)

first tried their system, which was carried across the ice by a vehicle with tracks it broke through a crevasse, killing the driver and seriously injuring two engineers.

The next year the British, based at Halley Bay in Queen Maud Land, attempted to chart the buried land using the equipment designed here. Three men were lost as well as all scientific records from that journey and some from an earlier traverse.

The airborne equipment to be used on the coming flights records the ice depths on 35-mm. film and, at the same time, displays the data so that the crew can make any needed adjustments. In this respect they believe the system is superior to the American one, which tape-records the data with no on-the-spot display.

Airborne sounding represents a radical advance over past methods. The standard technique has been to set off explosive charges every few miles, recording the interval before the first echo returned from the rock far below. Only a few such soundings per day could be made, what with the hazards of over-ice tractor travel.

Furthermore the record was not continuous and many features between explosion sites were unobserved. The radar method provides a continuous profile. The radar beam, in the suitable frequency range from 20 to 100 megahertz (megacycles), is very wide and hence additional echoes are obtained from surfaces not directly beneath the plane.

This generates some rounding of the inscribed profiles, if the terrain is rough, but the distortion can be removed. A computer method to this end is being devised here. It has been found that the radar measurements are generally as accurate as those made with explosions.

A third method is to estimate depth from highly sensitive gravity measurements. These indicate how much low-density material (that is, ice) lies between the instrument and the rock below. This is quicker than explosion sounding, but less accurate.

In preliminary tests more than 16,000 miles of Antarctic terrain have been scanned by radar, However it was found that any attempt at mapping would be futile unless accurate navigation was possible over the featureless ice sheet covering one of the largest and most rugged continents of the world.

The new flight lines have been laid out to make possible navigational "fixes" on an abandoned sno-cat here, a rock outcrop there, and other landmarks in the remote interior.

The plane, on occasion, will refuel at such far-flung stations as the South Pole and Halley Bay, but will still be unable to cover the most distant zone of the continent.

Ultimately the British hope they can be provided with a survey plane fitted with an inertial navigational system that will give them a continuous record of position.

Although their equipment can penetrate more than two miles of ice, it did not strike bottom in parts of Marie Byrd lieve this was because heat Land. The specialists here believe this was because heat from within the earth has made the deep ice of that region soggy.

There is evidence of latent or intermittent volcanic activity in Marie Byrd Land, and radar pulses would not be able to penetrate the soggy ice produced by such activity.

MAMMALOGISTS ACT TO PROTECT WHALES

The American Society of Mammalogists has acted to further methods of conserving fast vanishing stocks of whales, red wolves and bats, the American Museum of Natural History reports. And the society has resolved to aid in the preservation of other endangered species through legislation.

The mammalogists, a people interested in the study of mammals, commended the International Whaling Commission for the steps it had taken to limit the catches of whales. They then called for the commission to abolish the Blue Whale Unit system of determining sizes of catches of whales and to regulate whaling according to the best biological information available for each species and each stock of whales.

The society also called for the enactment of a plan to provide international observers on whaling ships to see that regulations were enforced.

—Star Photographer Rosemary Martufi

Eleven of the 13 veterans of the Byrd 1929 Antarctic expedition who gathered here yesterday: Front row—Lloyd Grenlie, Charles L. Kessler, Dr. Frank T. Davies, Leland L. Barter and James A. Feury. Second row—Anson W. Perkins, Henry T. Harrison, Norman Vaughan and Jack Bursey. Back row—John R. Bird and Edward E. Goodale.

Antarctic Byrd Men Meet

WASHINGTON, Nov. 30

It was the first time they had met in 30 years, and whenever a new one strolled into the warm, sunlit room there were loud explosions like "Good gosh! Look who just walked in!"

The parkas and frozen beards and the long, historic winter they had spent together on the great ice barrier in the Antarctic were in the past that had done so much to shape these men.

Off in one corner several of them, now bald or gray, were laughing and recalling stories of the dog teams. Another pair was spinning terrifying yarns about the three-day storm aboard the sturdy, 512-ton bark that sailed them to and from the coldest and windiest continent on earth.

The survivors of the Richard E. Byrd expedition which made the first flight over the South Pole on Nov. 29, 1929, were meeting on the 40th anniversary of their journey at the Olde Colony Motor Lodge in Alexandria.

Of 42 members of the primary party, 18 are living today. Thirteen showed up for the reunion: Leland L. Barter, John R. Bird, Jack Bursey, Frederick E. Crockett, Arnold H. Clarke, Dr. Frank T. Davies, James A. Feury, E. E. Goodale, Lloyd Grenlie, Henry T. Harrison, Charles L. Kessler, Anson Walker Perkins, and Norman Vaughan.

The heroic age of polar exploration had ended with men like Robert Falcon Scott, de Gerlache and Borchgrevink, and Shackleton and Amundsen and Mawson. The technical age arrived with Byrd, although adventurous treks into the frozen wasteland continued in the Byrd expedition of 1929-30.

The expedition set out on Aug. 25, 1928, aboard the aged bark "The City of New York." It arrived at the Ross Ice Shelf on Christmas Day, left the barrier on Feb. 19, 1930, and arrived back in New York in June.

Harrison, of Weaverville, N.C., was one of the organizers of the expedition's reunion. He spoke of the fears of some of the men: The fear that the barrier reef on which they were living would break off and strand them at sea, of the strange 6-month darkness—and of the cold . . . always the brutal cold.

Byrd and three others had to toss out six weeks' food rations to lighten their stalling Ford trimotor plane nearing the plateau of the South Pole, but they made it.

As Byrd wrote: "The temperature was 15 degrees below zero F. Clouds obscured the horizon in several places. No mountains were in sight. The Pole lay in the center of a vast plain. We opened the trapdoor and dropped our flag."

Harrison recalled that a "wild celebration" greeted the plane when it landed back at its Little America base.

"It was Prohibition then, of course," he says, "but we had 100 gallons of pure grain alcohol along for medicinal purposes. We mixed it with some strong orange syrup and had ourselves a party."

These were, perhaps, the first screwdrivers served in the Antarctic.

They gladly left the lands that have recorded record low temperatures of 126.9 degrees below zero and howling 100 mile-per-hour winds that are known as "katabatic" winds, but some members of the party returned for the second Byrd expedition of 1933-1935.

On the return voyage "The City of New York" ran into a horrendous storm, recalled John R. Bird, who took some chilling photos of the ice-laden vessel plowing through gales with her lee rail buried in the sea. The photos were on display yesterday.

One of the saddest moments of the expedition came when they left Antarctica. "We had to shoot about 60 dogs," recalled Jack Bursey. "We became very attached to them over the months while using them on geological explorations."

But now the continent with 7 million cubic miles of ice was long behind them as the reunion progressed from lunch yesterday to films of the expedition, to cocktails and then dinner.

The talk was all of 30 years ago, and of storms in sailing vessels that are no more, and of the kind of men who lived on seal and penguin meat, and on dog meat when they had to.

Now they were old, and retired, with the Antarctic safely tucked away in their memories, and what had been miserable and horrible had now become something nostalgic and worth laughing about.

The New York Times Dec. 7, 1969

Antarctic Flights Are Under Study By New Zealand

The New York Times

AUCKLAND, New Zealand, Dec. 6 — Tourist flights to Antarctica may begin between December, 1970, and February, 1971.

A decision will probably be made within a few weeks. But prospective pioneer passengers will need to get their applications in promptly once bookings open.

Air New Zealand, the New Zealand international airline that is investigating the service, already has a long list of inquiries and applicants from all over the world, even before the date is fixed or prices determined.

A technical team from the civil aviation division of the New Zealand Ministry of Transport and from Air New Zealand has just returned from Antarctica after a study there of plans for the service. It had talks with United States air crews, maintenance men, air traffic controllers and meteorologists working in the area.

The team found that the 9,000-foot Outer Williams Field runway, on permanent ice about 15 miles from the United States base at McMurdo Sound, was suitable for DC-8 jet airliner landings during the Antarctic "summer." The best of the weather is usually from mid-January to mid-February.

A DC-8 can fly from Christchurch, New Zealand, to McMurdo, a distance of 2,400 miles, in four to five hours.

A likely initial proposition is for the stationing of a ship at the edge of the ice in McMurdo, about 14 miles from Williams Field, to act as accommodation for tourists. This would allow passengers to stop over for a week or so to see something of life in the polar regions.

From five to eight return flights would be likely in the first season, but no firm decisions on the service have yet been reached. The flow of advance inquiries is indication enough of tourist interest in being in on a new "first."

The 7,760-ton icebreaker Fuji with the 40-member Japanese Antarctic expedition team leaves the Harumi Pier, Tokyo, Tuesday morning as about 2,000 family members of the team, the ship's crew and other well-wishers thronged the pier to see it off.

The Japan Times

11th Antarctic Expedition Leaves

Nov. 26

The 40-member 11th Japanese Antarctic expedition left Tokyo Port Tuesday morning aboard the 7,760-ton icebreaker Fuji.

About 2,000 families of the scientists, crew members and other persons accompanying the expedition sent off the party at the pier at 11 a.m.

The 11th party includes a 30-man wintering team, the largest ever sent to the "white continent" by Japan since its base was built in January 1957 on east Ongul Island off Antarctica.

The ice-breaker Fuji, manned by a crew of 182, is due to reach near the Showa base early in January.

The new wintering team, led by Tatsuro Matsuda, will relieve the 10th wintering team late in February.

During the coming year, the new wintering team will fire two one-stage rockets to observe the aurora phenomenon in the ionosphere.

Other tasks of the party include aerial surveys of Enderby land around the Japanese Antarctic base and an overland trip to the hinterland.

The Fuji is scheduled to return to Tokyo Port in April.

COVER ON ANTARCTIC IS 13,244 FEET THICK

Soviet scholars have found that the maximum thickness of the icecap covering the Antarctic is 4,038 meters (13.244 feet), Tass, the official Soviet press agency, reports.

The scholars have also studied the relief of the icecap and sections of land free of ice, as well as the basic outline of the relief under the ice.

These and other important scientific data are contained in the last volume of the "Atlas of the Antarctic." The first volume includes a thousand maps, graphs, diagrams and drawings. The second volume describes the nature of the Polar continent, and covers the history of its discovery and exploration.

The atlas explains in detail the Soviet Antarctic expeditions and throws new light on the geological structure of the continent as well as the climate of the Antarctic.

First rocket base in Antarctic

MOSCOW (AP) — The Soviet Union has built what it calls the first permanent base for launching weather rockets inside the Antarctic Circle.

The official news agency Tass said the base is at the Soviet Molodezhnaya station in Antarctica. It said that with the rockets, which go up 60 miles, new information will be obtained about weather conditions.

Zoo's Penguins Are Warm To Emergency Ice Blocks

ST. LOUIS (UPI)—The St. Louis Zoo ordered several hundred pounds of ice for its penguins when the air-conditioning failed in the acquatic house.

The ice lasted about the time required for repairs, keeping the pengins happy and in good health.

A zoo official said some of the penguins had not seen ice since they were in the Antarctic. He said the penguins had not only sat on the ice, but that they had also pecked at it and "snuggled up next to it."

Command of Naval Support Force Transferred to Admiral Welch

U.S. Navy Photo

In a brief ceremony held at the historic Washington Navy Yard on June 19, the command of the U.S. Naval Support Force, Antarctica was transferred from Rear Admiral J. Lloyd Abbot, Jr., to Rear Admiral David Fife Welch.

Admiral Abbot, who had headed antarctic logistical operations since February 25, 1967, will assume command of Carrier Division 16, based at Norfolk, Va. His tour with *Operation Deep Freeze* was marked by the first scheduled winter flights to Antarctica, the dedication of a permanent Palmer Station, the construction at McMurdo of the Antarctic's largest building, the acquisition of a fifth LC–130 Hercules for Antarctic Development Squadron Six, and increased use of satellite technology. A project of special interest to him was the inauguration of a program to inform support personnel about the objectives, nature, and achievements of antarctic research.

The Support Force's new commander, a native of Indiana, was commissioned in the Naval Reserve in 1941. He subsequently served on antisubmarine duties in the Atlantic, earning the Bronze Star Medal. In 1945 and 1946, he commanded first a high-speed transport and then a destroyer escort. After postgraduate studies, he took command of Underwater Demolition Team One and led that unit in night hydrographic surveys under fire and in reopening the port of Chinnampo, Korea. For his serivce with UDT–1, he was awarded the Silver Star. Admiral Welch's other commands have included USS *Bausell* (DD–845), Mine Squadron 10, the Atlantic Fleet's Amphibious Training Command, and Amphibious Group 4. It was from the last of these that he came to *Operation Deep Freeze.*

Admiral Welch's shore duty has included service as Assistant Chief of Staff for Logistics with U.S. Naval Forces, Europe, for which he was awarded the Legion of Merit, and in senior staff positions with the Military Assistance Command, Vietnam, where he earned a Gold Star in lieu of a second Legion of Merit.

Admiral Welch holds a B.A. in chemistry from Franklin College of Indiana, and an M.A. in education from George Washington University. He has also attended the Naval War College and the NATO Defense College, and taught at the Naval War College. He was promoted to rear admiral in 1968.

Norwegians Concerned Over Historic Vessel

OSLO, Sept. 6 (AP)—Norwegians expressed concern and outrage this week over reports that the historic sailing ship Gjoa was being damaged by wind, sand and hippies in San Francisco's Golden Gate Park.

The Norwegian explorer Roald Amundsen made the first voyage through the Northwest Passage in the vessel in 1903 to 1906. It was later given to the City of San Francisco and installed in Golden Gate Park as a tourist attraction.

Tor Gjelsvik, director of the Norwegian Polar Institute, said he visited the Gjoa in 1966 and found it was being "sandblasted" by wind-driven sand off nearby beaches. More recent newspaper reports complained the ship had been used as living quarters by hippies and was rotting away.

The independent Oslo newspaper Morgenposten said that plans to move the Gjoa into the San Francisco Maritime Museum had been dropped. The report led to a chorus of demands that the ship be repatriated to Norway and housed under cover together with other historic ships.

MINUTE LIFE FORMS FOUND IN ANTARCTIC

PASADENA, Calif. (AP)—Scientists have found minute forms of life on a volcano-wracked Antarctic island they believe is much like the polar regions of Mars.

Dr. Roy E. Cameron, a microbiologist for the Jet Propulsion Laboratory, said in a report that algae, fungi and bacteria started to grow in lava rubble a year after Deception Island was rocked by volcanic blasts in December, 1967.

Dr. Cameron and Dr. Robert Benoit, microbiologists at Virginia Polytechnic Institute, lived six weeks on the island and left last February, just before it was torn by a new eruption. The island, 8 miles wide and 10 miles long, is situated off the Antarctic Peninsula, 1,000 miles below the southern tip of South America.

"There was no visible plant life growing on the volcanic slopes, but marine algae were found within the three main craters on the island," the report said. "Most of the samples were gathered near fumaroles (steam vents) where temperatures of 170 to 210 degrees Fahrenheit were registered."

JOSEPH A. PELTER, 61, BYRD'S CAMERAMAN

PENSACOLA, Fla., Aug. 14 (AP)—Joseph A. Pelter, 61, chief photographer for Adm. Richard E. Byrd's 1933-35 expedition to the South Pole, died Wednesday.

Mr. Pelter, a retired Navy warrant officer, was responsible for the aerial photography and mapping of 200,000 square miles of the Antarctic. He was awarded a Congressional medal for his work.

He retired here after being station at the Pensacola Naval Air Station.

Mr. Pelter was the patient in the first major surgery performed in Antarctica. In March, 1934, he was operated on for acute appendicitis at Little America by Dr. Louis H. Potaka, physician with the Byrd expedition. The water was obtained by melting snow, the operating room was the shack of the broadcasting station. Mr. Pelter recovered quickly.

Coast Guard Vessel Makes Second Greenland Rescue

A United States Coast Guard helicopter rescued 12 Dutch explorers off the Greenland coast last Saturday—the second such successful rescue in five days, the Navy Military Sea Transportation Service reported on Sept. 2.

The helicopter took off from the Coast Guard icebreaker Westwind and lifted the explorers from Angmassalik, Greenland, to Kulusuk, Greenland, in four trips, according to Rear Adm. Walter Schlech Jr., commander of the service's Atlantic command in Brooklyn.

The explorers, all from the University of Rotterdam, were conducting studies at the Knud Rasmussen and Haabets Glaciers. They had tried to reach Kulusuk three times in a small boat but had to return each time because of bad weather and heavy ice.

Five days earlier, the Westwind rescued five members of a University of London arctic expedition.

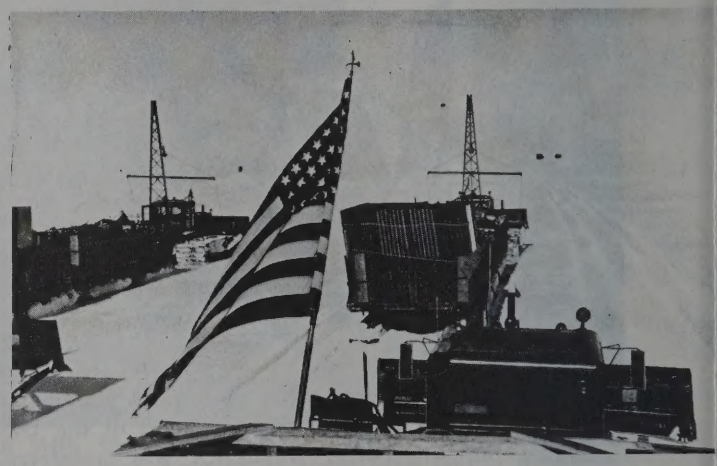
THE NAVY'S STAKE IN ANTARCTICA

BY WILLIAM J. CROMIE

U. S. Naval Institute Proceedings, October 1968

The runway was merely a broad path scraped out of the ice with a bulldozer. The skiis of the aircraft contacted it with a bone-jarring thump, and the four-engine, turboprop Hercules bumped and vibrated through a landing. Beyond the Plexiglass windows a million square miles of untrampled snow stretched away in every direction—the surface of an ice sheet bigger than the United States and 16,000 feet thick in places. The "town" served by this "airport" lies 25 feet beneath the ice. Population: 11 Navy men and 10 civilian scientists.

The plane slid to a halt near a knot of green-clad men and orange-painted vehicles. We stepped out, into 10° below zero cold and a biting 20-knot wind. Snow and overcast sky merged without a horizon. Nothing broke the barren, windswept surface but a field of antennas and exhaust stacks. One of the men, his beard covered with frost and his face half hidden by a parka hood, extended his hand. "Welcome to Byrd Station, gentlemen," he said.



Nearing the end of its circuitous 646-mile route—to cover 480 map miles—the first tractor train delivered a load of supplies to Byrd Station in December 1957.

Byrd Station is located at 80° South, 120° West—8,000 miles due south of San Francisco and 600 miles from the South Pole. It sits on 7,100 feet of ice but is only 5,000 feet above sea level. Temperatures drop to 80° below zero in winter and seldom rise above 0° Fahrenheit in summer. Wind velocities as high as 80 miles per hour are not unusual. The sun sets in April and does not rise again until late August. From October to February the sun stays up 24 hours a day. American scientists needed an outpost here to conduct studies of the Antarctic ice cap, aurora, weather, Earth's magnetism, electric layers and radio noise in the upper atmosphere, and seismology (earthquake waves). The Navy built them one.

The flight into Byrd Station and the station itself typify changes which have occurred since the Navy began continuous occupation of Antarctica in 1955. Swift, four-engine Hercules aircraft bring in 15,000 pounds of cargo in three hours where tractor trains once took weeks to zigzag slowly across the broken and crevassed surface. Where once platoons of Seabees erected buildings on the surface, facilities are now constructed underground or flown in completely assembled. Living conditions have improved immensely—both Byrd Station and the Amundsen-Scott Station at the South Pole boast flush toilets.

During the 885-mile flight from McMurdo Station, the main staging base in Antarctica, we had passed over areas carved into chaos by long, deep crevasses. Ice masses, moving in opposing directions, had once collided and the impact had left brutal scars great gorges, some of them as much as 40 miles long and 100 feet deep.

Rear Admiral George J. Dufek once told how advanced parties had probed for a way to bring supplies from Little America V to Byrd Station. The distance was 480 miles, but the first advance party had turned back 380 miles out of Little America. An 11-man Army/Navy reconnaissance party, working for six weeks, finally managed to find a safe route that wound 646 miles to cover the 480. Then, the Admiral continued, the first tractor train had delivered a load of supplies in December 1957:

> . . . these men covered the longest distance of any tractor party in Antarctic history, weaving past crevasses which the Empire State Building couldn't fill, following the trail which the advance team had blasted and bridged, often inching along the snow on their bellies.

Despite such severe and hazardous conditions, the Navy constructed seven stations in time for scientists to begin their studies during the International Geophysical Year—an 18-month long, worldwide study of the Earth which began on 1 July 1957.

President Dwight D. Eisenhower assigned the Department of Defense the role of supporting science in Antarctica. The Navy has been the executive agent for this support since 1955, although all services now participate in Operation Deep Freeze, as it is known. Since the first Deep Freeze operation in 1955–56, the Navy has been sending a force of about 2,500 men to the bottom of the world every year on the same budget—$19.8 million over the normal costs of operating the support ships and maintaining their crews. The National Science Foundation, which now finances and manages the scientific program, spent $7.7 million on the 1967–68 research program.

During the austral summer (September to March), about 1,000 men live in Antarctica. Each year, since Deep Freeze I, between 200 and 350 Navy men have wintered-over. They generally arrive in October or November, stay after the summer personnel leave in February or March, and leave Antarctica the following October or November. At present, about 200 scientists work on the ice in summer, and 35 winter-over.

Since 1957, some stations have been abandoned, others have been rebuilt and new ones have been constructed. Little America V and Byrd, originally built on the surface, soon became covered with drifting snow, After four years of operation, Little America V had to be closed in 1959.

Byrd Station was rebuilt, using a construction method pioneered by the Army in Greenland. A machine known as a "Sno-Miller" cut trenches, which were covered with steel arches. Snow was blown across the arches to create a level surface which minimizes build-up of drifting snow. The new station was commissioned on 13 February 1962, but ice problems continue.

As one walks along wooden sidewalks between the insulated buildings and the trench walls, it is apparent that the arches have started to buckle. The entire five-million-square-mile, 6,000-foot-thick (average) ice cap moves slowly outward from the center of the continent to the coast. This plastic flow exerts tremendous force, pushing the trench walls together and deforming the arches. Seabees have removed some of the bent arches and continually scrape snow from the walls, but the problem persists.

Heat rising from the buildings increases the rate of creep and aggravates the situation. But Seabees have come up with a unique cold

air system to counter this. From a room chiseled out of the ice, wherein temperatures average about 40° below zero, a large fan blows 10,000 cubic feet of air each hour into the tunnels.

As an example of the kind of scientific work going on at Byrd, the Army's Cold Regions Research and Engineering Laboratory (CRREL) has drilled out a core, or sample column, of ice extending from the top to the bottom of the Antarctic ice cap. Such a core serves as a frozen log containing a continuous record of the Earth's climate for hundreds of thousands of years. From the temperatures, thickness, and composition of the ice layers making up the cores, glaciologists determine seasonal temperature variations in the Southern Hemisphere and average yearly temperatures in West Antarctica. This information may tell scientists why the Earth periodically becomes locked in the grip of the Ice Ages, and whether we are presently entering or leaving such a period.

The eight-man CRREL team, working around the clock, drilled an average of 100 feet a day, penetrating the entire 7,100 feet of ice underlying Byrd Station on 29 January 1968. All through the ice, glaciologists found ample evidence of the movement that is menacing both Byrd and the South Pole Stations today.

The South Pole Station was also built on the surface during the IGY. While Seabees at Little America spent the 1956–57 austral winter preparing for the trek to Byrd Station, their mates at McMurdo Station put in 100,000 hours building a runway on 14-foot-thick sea ice to support the Navy and Air Force planes that would soon begin arriving from Christchurch, New Zealand.

Rear Admiral Dufek, first commander of U. S. Naval Support Force, Antarctica, chose an R4D named "Que Sera Sera" to attempt the first landing at the South Pole. A four-engine Navy Skymaster and an Air Force Globemaster provided navigational checks and carried survival gear. The planes took off on 31 October 1956.

Que Sera Sera touched down at 8:34 p.m. on 31 October. Ground elevation was 9,200 feet; temperature was minus 58° Fahrenheit. Dufek—who first went to the Antarctic in 1939 as navigator of Admiral Richard E. Byrd's flagship, the USS *Bear*—and this plane's six-man crew thus became the first Americans to set foot on the South Pole.

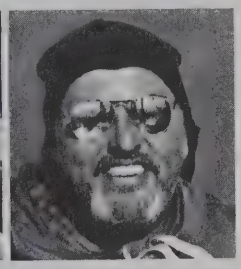
Harsh weather delayed further landings until the following month, when 18 men and 11 sled dogs began the occupancy of the South Pole that has lasted ever since.

Named after the first men to reach the bottom of the Earth, Norwegian explorer Roald Amundsen and British naval officer Captain Robert Falcon Scott, the Amundsen-Scott South Pole Station was dedicated on 23 January 1957. That same year it disappeared under accumulating snow, and within three years the crushing overburden was a problem. Rather than construct a new station, the original one was reinforced with a combination of metal arches and wood shoring. But, as elsewhere, constant movement of the ice continues to cause the boards to crack and the metal beams to bend like hairpins.

Thirteen naval personnel and about nine civilians usually winter-over at Pole Station.

In 1957, Dr. Paul Siple, the first civilian station leader, erected a barber pole at what he computed to be the position of the geographic pole. Since Dr. Siple is an alumnus of Princeton, the Pole pole is black and orange rather than red and white. Shifting ice has moved this monument 4,000 feet in 11 years.

George J. Dufek



Paul Siple

Heat from the buildings melts cavities in the four-to-12 feet of overlying ice and melt water seeps into some of the working spaces. Refreezing causes stalagmites to grow up from the floor, and one shop has a four-inch ice covering on the deck. To relieve this condition, the Seabees dig holes through to the surface and the frigid air coming in prevents melting. The station experiences an average temperature of −60° Fahrenheit. Record low is 113° below zero, 145° below freezing.

Structurally, Pole Station is in worse shape than Byrd. Either a new station must be built or the South Pole must be abandoned as a research site. With the Soviet Union maintaining bases in Antarctica, there are reasons other than science for occupying the Pole, so a new station is planned in the next two or three years. The type of construction has not been decided, but it will either be built in the same way as Byrd, or elevated above the surface on columns. Even though most of the snow would then blow beneath the buildings, some will accumulate. When this happens, the buildings can be jacked up and the columns extended. This type of construction is too expensive to be used unless the accumulation problem is very severe.

When the United States first built the South Pole Station, it depended solely on air-drops for delivery of equipment and supplies. When Little America V closed in 1959, aircraft took over support of Byrd Station as well. Parachuting and free-dropping cargo had certain drawbacks. It placed a heavy burden on the small complements of inland stations who had to recover the scattered material, haul it to camp and store it. Manhandling large numbers of 55-gallon drums—each of which weighs 350 pounds—containing fuel to heat buildings, generate power, melt snow for water, and propel vehicles and aircraft was a backbreaking job.

In January 1960, the Air Force brought the first ski-equipped C-130 planes to Antarctica and operated them out of McMurdo Station. Capable of landing in flat areas anywhere, these aircraft proved so versatile that the Navy obtained four Hercules later that year. They began bringing in dry cargo during the 1960–61 season and, by Deep Freeze 63, had replaced the drum-dropping C-124s. Equipped with 3,500-gallon tanks, the LC-130s bring in 3,000 gallons of fuel on a flight and it is pumped directly into rubber storage bladders in a few minutes. The Navy plans to acquire two more LC-130s and use these planes exclusively for support of inland stations.

Starting in October, Hercules aircraft with cargo and C-121J "Super Connies" with passengers fly 2,250 miles south from Christchurch to McMurdo. No emergency landing areas exist on the way and survival time in the frigid waters of the Antarctic Ocean and Ross Sea is less than ten minutes. Two destroyers take turns as picket ships at 60° South in some of the stormiest seas in the world.

From McMurdo, (77°51′ South) planes fly men and supplies to Byrd (885 miles), Pole (820 miles), Plateau Station (1,275 miles) and Hallett Station. The latter is a joint U. S./New

Most of "downtown" McMurdo Station's 122 buildings are visible in this photograph of the main U. S. staging base, taken from Observation Hill, on which is located the combination nuclear power reactor and desalting plant.

Zealand facility 380 miles north of McMurdo on the coast.

The planes bring in about 500 tons of high priority cargo and reliefs for the men who have been isolated since March. In December, winds and warm weather break up the sea ice surrounding Antarctica enough for icebreakers to force a channel to McMurdo. Cargo ships and tankers follow the icebreakers and off-load about 25,000 tons of cargo. About 5,000 tons move to inland stations.

The smaller inland stations are constructed with prefabricated vans. In 1963, ten 8′×8′ ×27′ vans, built to fit into a Hercules aircraft, went by ship to McMurdo. Here they were fully furnished for their intended use before being flown to a new station site 1,350 miles from McMurdo at the base of the Antarctic Peninsula, south of South America. Mounted on specially designed ski-equipped platforms for towing, eight vans were placed in parallel rows of four each with flooring installed between the rows. With roofing added, the whole complex formed a large building with eight rooms around a central hallway. Named "Eights Station," after James Eights, the first American scientist to reach Antarctica, the new station became fully operational in less than a month. The Navy and National Science Foundation suspended operations at Eights in 1966, and it is now a ghost town buried under ten feet of snow.

Plateau Station was built with four vans on the high, desolate polar plateau 600 miles from the South Pole in January 1966. At an elevation of 12,000 feet, this is the coldest, most remote outpost occupied by Americans. On 24 August 1966, scientists recorded a low of −121.4° Fahrenheit here. (Record low for anywhere on Earth was recorded at the Soviet Union's Vostok station in August 1960 when temperatures reached an incredible 127 degrees Fahrenheit below zero.) Four Navy men and four civilians man Plateau Station year-around. The scientists concentrate on observations of weather, aurora, the ionosphere, and very low frequency radio noise in the atmosphere. The Navy medical officer in charge of the station carries out a program of medical research.

In sharp contrast to Plateau, McMurdo Station is a small city, with 122 buildings. Its original function as a logistic base has steadily increased. It took over some of the scientific program when Little America V closed in 1959. Now the principal U. S. station for biological research, it boasts an excellently equipped biological laboratory. Other scientific work includes cosmic ray monitoring, ionosphere studies, and satellite observations. About 200 people spend the winter here. In summer the population is about 800.

McMurdo Station has its own hospital, fire station, church, library, post office, gym, theater, officers' and enlisted men's clubs, and a dial telephone system. (There is even a number to call if you spot a leaky faucet.) Twelve years ago, the hospital consisted of four beds in half a quonset hut. Today, a large, modern dispensary, only one year old, is equipped to do major surgery, all types of dental work, and complete x-ray examinations.

Mr. Cromie received a B.S. degree in Geology from Columbia University in 1956. He served in Merchant Marine cargo ships at the age of 15, in 1945, and with the Military Sea Transportation Service in Korean waters from 1951 to 1953. He was a member of the IGY scientific staff in Antarctica from 1956 to 1958. In 1958, he served as oceanographer aboard Columbia University's schooner *Vema*, which was engaged in oceanographic research in the Indian Ocean-Red Sea area. He organized and acted as head of Columbia University's Arctic Ocean Expedition in Drifting Station Charlie in 1959–1960. Last year, he returned to Antarctica to participate in Operation Deep Freeze '67. He is Associate Editor of World Book Encyclopedia Science Service.

Since Antarctic research will probably continue indefinitely and Navy volunteers are becoming increasingly hard to obtain, the policy is to make duty there as pleasant as possible. Station development plans stress greater logistics efficiency and up-to-date scientific facilities. The other countries maintaining expeditions in Antarctica have developed similar programs, and over the years, living and working conditions on the frozen continent have grown steadily better.

In 1957, at Little America V, the author and two other civilians lived in a cubicle so small we all could not dress at the same time. In 1967, on a flight to the South Pole, the copilot, a lieutenant, told me, "we live pretty well at McMurdo—wall-to-wall carpeting, nice quarters, and a bar." At the Pole Station almost everyone now has his own room. Each enlisted man lives in a cubicle about the size of my room at Little America. These are panelled and have indirect lighting—luxuries which we lacked. A few men have put finished floors in their rooms and some have installed doors and locks.

It has been estimated that 80 per cent of the fresh water in the world is in the Antarctic ice, but it is difficult to obtain. Snow and ice must be loaded onto a sled by hand or bulldozer and transported to camp, a distance of several miles, at McMurdo. It is then dumped or shoveled into a melter that uses the waste or exhaust heat from diesel engines powering the generators. At a station the size of McMurdo, such snow melters cannot keep up with water needs, so additional oil-fired melters are employed. Two 12-hour shifts of "snow queens" keep the melters supplied around the clock, but water conservation must be practiced, and water hours are set during the austral summer. Visitors and station personnel receive a pamphlet advising "Take a Navy shower every seven to ten days; however, frequent sponging off of delicate body parts is mandatory."

In addition to the labor involved, melting snow requires considerable expenditure of fuel, the most precious commodity shipped to Antarctica. During Deep Freeze 67, the Navy moved over two million gallons of diesel and automotive fuels and four million gallons of aviation gas to McMurdo. Moreover, it requires 1.3 gallons of fuel to deliver one gallon of fuel to an inland station.

To simplify fuel handling, piston-engine helicopters are being replaced with turbine-powered "whirly birds." Since the latter burn JP-4, the same fuel as the Hercules, only one type of aviation fuel will be required. To reduce consumption, many of the temporary, individual structures at McMurdo are being replaced with two-story, multi-purpose permanent buildings. Separate living quarters, messing facilities, laundry, and lavatory spaces will be combined under one roof.

A combination nuclear power reactor and desalting plant, installed at McMurdo, saves 700,000 gallons of diesel fuel a year. The reactor began operating in March 1962, and now has accumulated more hours of operation than any U. S. plant except two. Operated entirely by naval personnel since 1964, the 1,800-kilowatt-hour facility forms the primary source of electricity at McMurdo Station. However, many problems have plagued the power unit and it is not providing the hoped-for economy.

The distillation unit, built in 1963, did not become fully operational until December 1966. About 10,000 gallons of water a day can be desalted, but summer needs exceed this capacity.

Understandably, one of the most acute problems of the nuclear unit is spare parts, a common frustration in Antarctica. If need for a part arises in August, it may not get on board ships arriving that year. Hence, the part would not reach Antarctica until December of the following year or later.

To bring desalted water from the nuclear unit to "downtown" McMurdo, Seabees have constructed a double feeder line and installed a sewerage system at the same time. Due to problems with electric heating tape wrapped around the lines and ice bursting the pipes, neither of these systems work yet.

The scarcity of water, the cold, and the abundance of flammable materials make fire as hazardous as the cold in Antarctica. If a building upwind of a station catches fire, the entire station could be destroyed in a matter of minutes. Butt cans and warning signs announcing "Fire is the great Antarctic monster" are everywhere. All personnel receive lectures and training in fire control. McMurdo boasts a fire detection system in 50 of the 122 buildings, and six firefighting units pump water laced with antifreeze and dry chemicals onto any blaze. No serious fires have occurred at U. S. stations, but, in 1960, eight scientists died in a blaze at a Soviet base in East Antarctica. At inland stations, well-stocked refuge huts some distance from the main camps provide shelter and food in the event fire destroys the station. However, at places like Plateau Station, which cannot be reached by aircraft for six months of the year, the chances of survival under these con-

ditions would be slim.

The wintering-over complement of each station includes at least a physician, who also serves as officer-in-charge at small stations like Plateau. All agree that fear of a major accident troubles them. One officer, isolated for eight months at desolate Plateau station, says, "I thought quite a bit about planes crashing and men being burned in a station fire. There wouldn't be much we could do with only hand fire extinguishers."

From 1955 to 1961, no planes landed in Antarctica during the cold, dark winter months. Then in 1961 a Navy P2V landed at Byrd Station to rescue a critically ill Soviet exchange scientist. Another successful emergency landing was made in 1964, and two winter mercy missions were flown in 1966. Based on these flights, the Navy decided to attempt regularly scheduled landings in 1967. The first of these missions encountered no problems and the LC-130 touched down at McMurdo on 18 June 1967. Personnel turned on every light at the station to welcome the plane, which landed in −39° Fahrenheit cold with a load of mail, fresh food, equipment, and scientists. A second "winfly" came in September and now the frozen continent is open on a year-around basis.

Navy people and civilians in Antarctica often disagree, but on the whole the two groups get along pretty well. Some scientists complain about living facilities. Others wonder if the high proportion of military personnel to civilians is necessary. (The Navy is trying to reduce this.) The majority of scientists, however, agree that the Navy's logistics support efforts are excellent. A CRREL glaciologist, who has been in Antarctica nine times in the past ten years, and is now working on the drilling program at Byrd, remarks, "Aerial support and mobility provided by the Navy is superior to that found anywhere else. In other places we have to put up with heavy drinking, unpunctual bush pilots, but Navy pilots are completely reliable and always up to snuff."

On 31 December 1959, the United States and 11 other nations signed a treaty regulating political and military activities in Antarctica. When it was finally ratified on 23 June 1961, the number of member nations had grown to 16. It provides that Antarctica "shall be used for peaceful purposes only." While the treaty permits the use of military personnel and equipment for the support of peaceful activities, it prohibits military bases, military maneuvers, weapons testing, nuclear explosions, and the disposal of radioactive waste. (Waste from the nuclear facility at McMurdo must be shipped back to the United States.)

The status of claims made by seven nations prior to the treaty remains unaffected. However, no activity which takes place while the treaty is in force can be used as the basis of a claim. The United States and the Soviet Union made no claims prior to the treaty and did not recognize those of other countries. Both nations, and other non-claimants, however, reserve the right to make future claims.

The treaty effectively sets aside Antarctica as a place for the peaceful pursuit of scientific knowledge. Each year, one American scientist does research at a Soviet Station and a Soviet worker winters-over at a U. S. station. Russian scientists man U. S. instruments installed at their Vostok station, and the Americans make an annual visit to that station. The treaty permits the inspection of all facilities in Antarctica, and the United States has inspected at least one station of the nine other countries doing research. So far, the Soviets have declined all invitations to inspect U. S. stations under the treaty, although a party did tour McMurdo's nuclear unit.

The Antarctic Treaty has already served as a model for a treaty preserving outer space for peaceful uses, negotiated at the United Nations in 1966. Conceivably, it could serve as a guideline for other agreements, such as one governing research in the Arctic. Clearly, the treaty is as important and valuable to the world as the scientific research that has been done in Antarctica.

Although the treaty prohibits military activity for its own sake, the Navy automatically reaps certain military advantages from its support of science. Experience gained on Operation Deep Freeze will be valuable anytime the Navy operates in cold weather. For example, the yearly supply expeditions serve to train personnel and test equipment under polar conditions. Much has been learned about the special problems of practicing medicine in cold weather and about the psychological screening of men for difficult duty at isolated stations. Experience in icebreaking can be applied to Arctic operations, as can the knowledge gained from building runways on sea ice and maintaining vehicles and aircraft under severe polar conditions.

The United States has explored more of Antarctica than has any other country, and the Navy has been an integral part of this exploration since Lieutenant Charles Wilkes proved it was a continent in the 1840s. The Navy's role has changed from one of pioneering the penetration of natural barriers to the support of permanent stations where scientists carry out the peaceful pursuit of knowledge. Despite extreme conditions and many unknowns, the Navy accomplished one of the most difficult missions in its history during the IGY. Every year since, the service has successfully mounted a tremendous logistics effort, and it proudly adopted the motto *Ad Sciencias Promovendas*. "Toward Scientific Progress." To assure this progress, the Navy provided new equipment and methods of construction as they became available, and at the same time continued to improve the living and working conditions for both military men and scientists.

The progress has not been made without a price. Since 1954, 29 U. S. Navy men have lost their lives in Operation Deep Freeze. Nevertheless, the work goes on.

Legend

Sept. 21

Legends or folk tales have become a design feature of stamps from a number of countries. Last Thursday Greenland issued an 80-ore, brown stamp, based on the legend of "The Girl Who Was Abducted by the Eagle."

The legend begins with two girls playing on the beach.

Jens Rosing, who designed the stamp, tells it this way:

"When a big eagle appeared above them, one of the girls shouted, 'He is the man I want for a husband.' At once the eagle dived, he grasped the girl and flew away with her. The eagle placed the girl on a narrow rock ledge from which she could not get down, and she wept very much.

"Every day the eagle brought food to her: birds which it had caught. The girl carefully removed the tendons from the wings of the birds and secretly made a string of tendons. As the days passed, the girl became more cheerful, which aroused the suspicion of the eagle, but she reassured him by saying that it was because she had gotten to like him so much.

"One day the string of tendons was long enough to permit the little girl to lower herself down the mountain side while the eagle was out hunting. And she ran home to her village."

As the southernmost post office in the world, Scott Base holds a keen fascination for philatelists, who write from many countries for Ross Dependency stamps cancelled with the Scott Base datestamp.

From October last year to February this year, for example, the Base Office collected $1,728 from philatelic sales — not bad for a small community whose summer population rarely exceeds 40. In November alone more than 1,300 letters were received, 500 through the mail, a further 400 from Americans at the nearby McMurdo Sound Base and more than 300 from travellers on Byrd Memorial flights over the North and South Poles. Part of the reason for this exceptionally high figure is thought to be an article on Ross Dependency stamps, illustrated with photographs, published in a German national newspaper. Just on two-thirds of the letters received through the mail were from German philatelists.

During the busy summer months Postmaster Brian Hool and two assistants man the tiny post office—but in winter, when the flow of mail ceases and radio becomes the Base's only link with the outside world, only Mr. Hool remains.

The history of New Zealand stamps in the Antarctic also fascinates students of philately. Of all the stamps issued in the world since the turn of the century, for instance, few would be as puzzling as the first stamp ever produced by the New Zealand Post Office for use in the Antarctic—the King Edward VII Land Issue. Not only were these 24,000 overprinted "Universal" stamps never used in the land for which they were intended, but there is no authentic record they were ever taken there. Pack ice stopped Lieutenant Ernest Shackleton from reaching his destination and he opened the first Antarctic branch of the New Zealand Post Office aboard ship. Later, on January 7 1909, he opened a branch on an inland plateau "in the sphere" of King Edward VII Land—but he never reached the territory.

Shackleton, as New Zealand's first postmaster on the great ice shelf, began a tradition that party or expedition leaders became part-time postmasters. Notable among these were Robert Falcon Scott, Sir Edmund Hillary and author Adrian Hayter. It was not, in fact, till 1967 that a permanent post office was set up at Scott Base and Mr. George Edlin, previously a radio operator at Awarua Station, was appointed first full-time postmaster.

A special datestamp used in January 1958 commemorated the crossing of the Antarctic continent by a British party in 1908; another, four years later, also celebrated a 50th anniversary, this time of Scott's polar journey. The visit to the Antarctic in 1963 of Sir Bernard Fergusson, the then Governor-General of New Zealand, was the occasion for another special datestamp. Recent datestamps have marked the first 10 years' existence of Scott Base and the change in 1967 to decimal currency.

The Center for Polar Archives

The Center for Polar Archives was formally opened in the National Archives on September 8, 1967. It is designed to serve as a depository for gifts of private collections of papers from individuals and institutions as well as for records of the U.S. Government pertaining to exploration, research, and other types of activities in the arctic and antarctic regions. The primary objectives of the Center are to preserve, arrange, and describe polar-related records and to facilitate research on those that have had no restrictions placed on them.

Historical Background

U.S. Government exploration teams have been active in the polar regions for over 150 years. The records of their activities are as numerous as the subjects of investigation are wide ranging. It is important that these records and papers be preserved as part of the Nation's heritage.

As early as 1789 John Churchman, a surveyor-mathematician, proposed to the First Congress that the Federal Government sponsor a scientific expedition to Baffin Land to investigate high latitude magnetic variations. Congress refused to appropriate money for this scientific challenge and continued to deny money for polar exploration for many years. During the first half of the 19th century, U.S. merchants went to the sub-Arctic and sub-Antarctic in search of profit from whaling, sealing, and the China trade. Around the middle of the 19th century the Federal Government became more active in the polar regions as national pride and prestige became involved in scientific and geographical discoveries. Since the late 19th century the growing polar activity of both the U.S. Government and individual citizens has been primarily motivated by the need to understand our total world environment.

Early activities of the Federal Government included surveys by U.S. Navy ships in high latitudes, 1825–40; surveys of the periphery of the Antarctic Continent by the U.S. Exploring (Wilkes) Expedition, 1838–42; observations in high latitudes by ship captains in response to Matthew Fontaine Maury's program of compiling nautical and related charts while he was Superintendent of the Navy's Depot of Charts and Instruments; the ill-fated exploring expedition of the U.S.S. *Jeannette* in the ice of the Arctic Ocean, 1879–82; and the Lady Franklin Bay Expedition under Adolphus W. Greely, 1881–84, conducted as part of the U.S. contribution to the first international polar year. Recent Government-sponsored activity in the polar regions has included the pioneering U.S. Navy flights in northwestern Greenland and Ellesmere Island by Richard E. Byrd in 1925; the U.S. Antarctic Service Expedition, 1939–41, under the command of Byrd; and the many and varied activities of the U.S. Navy, Air Force, Army, Coast Guard, Weather Bureau, and other Government agencies in the Arctic during the 1940's and 1950's. Among such activities were those at Camp Century in Greenland and at the scientific stations on floating ice islands, those during the Ptarmigan flights to the pole, and those at the DEW line and JAWS stations. More recent activities have included the complete transect of the Arctic Ocean in 1958 by the nuclear submarine U.S.S. *Nautilus* under William R. Anderson and the continuing antarctic research programs of the National Science Foundation and the U.S. Naval Support Force, Antarctica, since 1955.

Equally important have been the private expeditions and scientific research activities that often pioneered the way to successful investigations of polar environments. Among these were the voyages of the early sealers, whalers, and China traders; the first two expeditions of Charles Francis Hall to the Arctic in the 1860's; Robert E. Peary's painstaking, carefully-planned explorations for reaching the North Pole, 1885–1909; Byrd's 1926 flight to the North Pole from Spitsbergen and his expeditions to Antarctica in 1928 and 1933; the important voyages of exploration into the North American and Greenland Arctic by Robert A. Bartlett, Louise A. Boyd, Lincoln Ellsworth, Donald B. MacMillan, Vilhjalmur Stefansson, and Hubert Wilkins; and the last private U.S. expedition to Antarctica—the Ronne Antarctic Research Expedition, 1946–48. To these should be added the varied scientific programs of private organizations, such as the American Geographical Society, the National Geographic Society, and the Arctic Institute of North America.

Holdings of the Center for Polar Archives

The National Archives and its Center for Polar Archives contain the richest sources available for information on the history of U.S. activities in the Arctic and the Antarctic from the 18th century to the present.

Included among the official records of the U.S. Government in the Center, for example, are records of the U.S. Naval Support Force, Antarctica, 1955–58; the Arctic Branch of the Arctic, Desert, and Tropic Information Center, 1943–45; the U.S. Naval Observatory, 1860–75; the Office of Antarctic Programs, National Science Foundation, 1955–65; and the U.S. Antarctic Service,

The U.S.S. *Polaris* fast in the ice off northwestern Greenland during the expedition commanded by Charles Francis Hall, 1871–73. This is a photographic reproduction of a painting, probably by H. J. Morgan, from a sketch made in the field by E. Schumann and Emil Bessels, members of the expedition. Both the painting and the sketch are among the holdings of the Center for Polar Archives, National Archives.

1939–41. Among the private papers are those of the American Society of Polar Philatelists, the American Polar Society, Dayton Brown, the Douglas Aircraft Co., Carl R. Eklund, August Howard, Robert E. Peary, Finn Ronne, Harold E. Saunders, and Paul A. Siple.

These records and papers include correspondence, biographical information, scientific and other observational data, journals, diaries, personal accounts, reports, memoranda, manuscript research papers and printed publications, maps and charts, still pictures, aerial photographs, sound recordings and motion pictures, and sketches and paintings.

Polar-related information in the National Archives may be found in approximately 50 record groups. Especially rich are those that describe U.S. Navy exploration and research. These are among records of the Hydrographic Office, the Naval Observatory, the Office of Naval Records and Library, and Naval Operating Forces. Further information on exploration and research may be found among the U.S. Coast Guard records. Early scientific polar data are among records of the Coast and Geodetic Survey, the Weather Bureau, and the Office of the Chief Signal Officer. Information of a descriptive and administrative nature is found with records of the U.S. Senate and House of Representatives, the Office of Territories, and the Bureau of Insular Affairs.

Objectives and Functions of the Center for Polar Archives

The primary goal of the Center is to collect and preserve official Government polar records and private papers of persons engaged in polar activity. Since the preservation of records and papers is useless unless they are used for research, an equally important goal is the facilitation of their use. In order to achieve this, the staff of the Center arranges and describes the records and papers in its holdings.

In addition, the Center staff identifies pertinent polar records in other divisions of the National Archives and in other Government agencies and private depositories. Also, it is compiling a comprehensive list and a documentary history of all U.S. polar expeditions and programs.

The Center replies to verbal and written requests for information about its holdings and related records, including those in the National Archives. A research room and a special library are available to searchers who want to work with the unrestricted records and papers in the Center.

Gifts of Private Papers

The Center accepts gifts of private papers that pertain to U.S. polar exploration and studies. Because of its extensive holdings of Federal polar records and its optimum physical environment in the National Archives Building, the Center for Polar Archives is an ideal depository for private collections of papers relating to the polar regions. The papers are kept in the Center's stack area, which is protected by fire walls and by automatically controlled temperature, humidity, and alarm systems. Absence of windows in the stack area prevents the fading of documents in sunlight.

Donors may impose restrictions on the use of materials given to the Center for Polar Archives. The conditions may provide that, for a period mutually acceptable to the Archives and the donor, the papers are to be examined only upon the specific authorization of the donor, or that for a time the papers will be withheld from public use, or that literary property rights will be reserved by the donor.

The National Archives will submit for the donor's signature a formal instrument of gift embodying any reasonable conditions that the donor may impose. Donors may, for tax-deduction purposes, obtain an appraisal from a qualified person of the value of the gifts offered. Instructions for the shipment of papers, at the expense of the National Archives, will be sent upon application to the Center for Polar Archives, National Archives, Washington, D.C. 20408.

After the papers have been received, they are reviewed and arranged in accordance with a plan for their most effective preservation and use. A detailed description is then prepared for staff use and authorized distribution.

THE NATIONAL ARCHIVES
NATIONAL ARCHIVES AND RECORDS SERVICE
GENERAL SERVICES ADMINISTRATION
WASHINGTON, D.C. 20408

Two 6c stamps to be released by the Canada Post Office on January 27, 1970, are the first produced under the guidance of the Department's new Design Advisory Committee. They will give recognition to centennial celebrations in the province of Manitoba and in the Northwest Territories.

Centered in the Northwest Territories design, printed in red and black by the steel engraving process, is a reproduction of Kenojuak's "Enchanted Owl" one of the most prized prints to come from Eskimo artists in the Northwest Territories.

The Northwest Territories' 1,304,903 square miles are about one third of Canada's total area. It was not until 1967, coinciding with Canada's Centennial Year, that the territorial administrative seat of government was moved to Yellowknife. Prior to that, in 1963, a full time Commissioner, based in Ottawa, had been appointed to build a territorial administration.

British Antarctica

The replacement of the existing 1 Pound definitive for use in the British Antarctic Territory has been announced by the Crown Agents Stamp Bureau. The issue is scheduled to appear December 1.

The design depicts "HMS Endurance." It is shown against a background of ice and snow with a helicopter hovering above it. The Queen is in the upper right.

Illustrated on the above 1 Pound definitive South Georgia will put in use on December 1 are two penguins. They are, respectively, the King and Emperor—(Crown Agents photo).

INTERNATIONAL ICE PATROL

By JOHN L. CAVNAR

Newark News Staff Writer

"THERE'S a big one at 11 o'clock," shouted Ens. Edward Tennyson. He was scanning the eternal emptiness of the ice-shrouded North Atlantic through binoculars from the flight deck of the giant Hercules HC130 flying boxcar.

The iceberg loomed menacingly, silhouetted against the crisp, azure sky to cast a gray shadow over the sea ice from from which it protruded as high as a 20-story building.

The U.S. Coast Guard plane, flying reconnaissance for the International Ice Patrol, had left the Argentia (Newfoundland) Naval Air Station less than an hour previously, and the pilot, Lt. Edward Weilbacher, was loafing along at less than 200 knots with two of the four prop-jet engines inactive, and at an altitude of less than 500 feet.

"We better mark it," said Tennyson, senior ice observer for the flight, and Weilbacher banked a little to his left and set his course directly for the berg.

Tennyson ducked down into the carvernous belly of the craft and to the tail section which opens to form a ramp large enough to accommodate a trailer truck. He secured himself with a strap and crawled to the ramp edge, carrying a gallon mayonnaise jar filled with a mixture of rhodamine-B and calcium chloride, a brilliant vermillion penetrating dye stain.

On command from Lt. Cmdr. James Webb, aircraft commander and co-pilot on the patrol, Tennyson dropped the jar over the tail ramp. It smashed against the side of the berg, spreading the easily detectable smear of red in a blood-like streak over the pale blue mountain of ice.

The iceberg was near the Strait of Belle Isle, about 52 degrees north latitude and safely out of the heavy shipping lanes of Newfoundland's Grand Banks. The marking was for quick identification in drift pattern studies.

"That one won't bother us for a while," Webb said. "It's locked in sea ice and pretty close to shore. But we like to know where they all are so we can keep a handle on things."

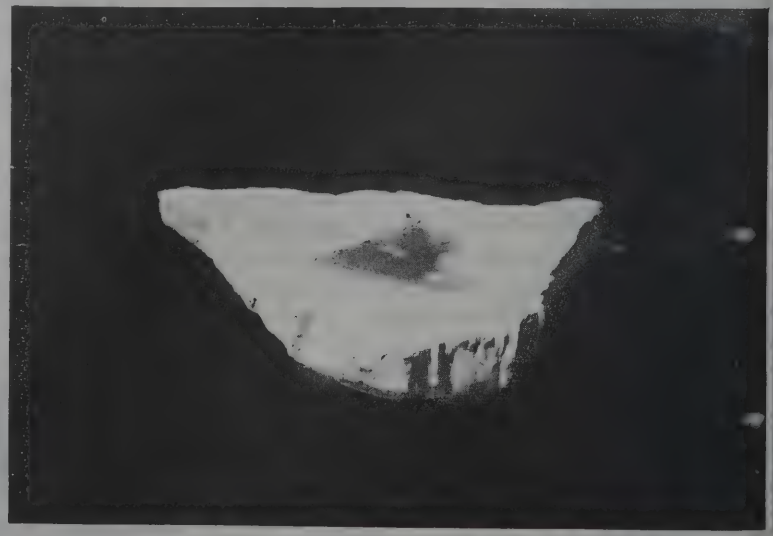
The berg was one of about 600 the Coast Guard keeps a record of each year and about at the end of its 1,800-mile journey from where it was calved probably three years ago in the glacial fjords of the west shore of Greenland.

The concern of the International Ice Patrol are the bergs that drift below the 48-degree latitude to imperil shipping. Of the estimated 7,500 bergs calved annually on the Greenland bank, an average of 380 reach the waters off Newfoundland to threaten shipping until the warm flow of the Gulf Stream destroys them.

The ice patrol likes to keep a lookout on what's going on farther north, but when the bergs reach the 48th parallel each one is pinpointed on charts both in the ice office in Argentia and in the International Ice Patrol headquarters in Governors Island, N.Y.

The location of icebergs learned by the ice patrol and by intelligence radioed to the New York headquarters from ships encountering bergs is compiled and

Medium iceberg surrounded by sea ice. Note remnants of pressure ridge on the piece of ice in the foreground.



Large Tabular Iceberg is 75 feet high, 200 feet wide, and 400 feet long. Note pool of melt water in the center of the berg.

Ice Patrol Operations in New York. Information gathered from reconnaissance flights, ship reports, and other sources are compiled and analyzed for the preparation of the twice daily Ice Broadcast.

U.S. Coast Guard Radio Station, Argentia, Newfoundland. Here reports on weather, sea conditions, and all known ice in the Southern limits of the Grand Banks of Newfoundland are radio broadcast twice daily to all shipping. Reports are also teletyped to the U.S. Naval Oceanographic Office in Washington D.C., Canadian Naval Radio, Halifax, and to other land stations.

broadcast twice daily from the U.S. Coast Guard station in Argentia. Ships flying the flags of the 16 nations which underwrite the cost of the International Ice Patrol are alert to tune in on the International Morse Code broadcast.

"But any ship can listen," said Cmdr. James Kelly, commander of the ice patrol in New York, "we can't stop anyone from listening in, and we wouldn't want to if it saves lives."

And it does save lives. Not one life has been lost in an iceberg collision in the 33,000 square miles of North Atlantic under surveillance of the International Ice Patrol since its inception 56 years ago.

An almost universal demand for a patrol of the ice zone arose following the sinking of the steamer Titanic on April 14, 1912, when she struck an iceberg in the Grand Banks. For the remainder of the ice season that year the area was patroled by two Navy scout cruisers. Two Coast Guard cutters, under direction of the Treasury Department, performed the duty in 1913. The patrol has been by air since 1947.

Interest in the service continued and, in 1914, representatives of the maritime powers of the world provided for the inauguration of an international derelict-destruction, ice-observation and ice-patrol service, consisting of two vessels which would patrol the ice regions during the season of danger from icebergs and attempt to keep the trans-Atlantic lanes clear of derelicts during the remainder of the year.

The United States was invited to undertake the management of the service with each participating nation contributing on a "pay-as-you-benefit" basis computed by determining the total tonnage of each signatory nation passing through the ice-patrol area.

Governments contributing to the ice patrol's $500,000 operating costs include Belgium, Canada, Denmark, France, Germany, Great Britain, Greece, Italy, Japan, Liberia, Netherlands, Norway, Panama, Spain, Sweden and Yugoslavia.

The penetration of icebergs into the shipping lanes is as unpredictable as the weather that spawns and propels them. The heaviest recorded year for imperiling icebergs was 1929, when more than 1,300 drifted into the shipping lanes. "That was before we used planes for locating them and keeping track of them," reminded Lt. Cmdr. Webb.

More than 900 were watched closely until they melted away in 1959 and more than 1,000 in 1957. In comparison, no bergs traveled south of the 48th parallel in 1966 and unless 1969 is a "late year" as Webb believes it may be, when the bergs will drift down as late as August or September, there'll be none this year.

"The wind has a lot to do with it," Webb explained. Since the season started in early March there's been a continuing and strong easterly wind that's holding the bergs against Baffin Island and breaking them up.

Most of the icebergs which find their way to the North Atlantic shipping lanes are formed when the great glacial sheet of Greenland, forced by its sheer weight, shifts down the coast into Baffin Bay and snaps into bergs weighing millions of tons each.

The west Greenland current propels them northward up the

coast of Greenland where they are caught in the southerly Laborador current and carried along Baffin Island, through Davis Strait and down into the Grand Banks where they can flow either east or west in the Gulf Stream.

The travel speed of icebergs averages about 10 miles a day, but bergs and field ice have been known to drift 30 to 40 miles a day for periods up to six days.

The season for bergs in the shipping lanes lasts from February to July, when the ice patrol flies at least three times a week unless the area is shrouded by the prevalent Newfoundland fog. "We know we can't go every day because of the weather," Tennyson said, "but we fly every day we can."

The daily patrol, which lasts about six hours and covers more than 1,000 miles, is determined in Governors Island, based on previous berg sightings, meteorological reports, and information from commercial ships. The search area, described in longitude and latitude limits, is teletyped to Argentia where the senior ice observer, Ens. Tennyson, diagrams the day's flight map. Ens. Jack Mast, a pilot and navigator, plots the course, which is seldom adhered to strictly because of sightings of possible bergs by the observer and by radar blips 10 to 12 miles off course that the observer believes should be investigated.

When the bergs are found there's nothing the ice patrol can do but wait them out and keep close tabs on where they are.

Land mines barely dented them and thermite bombs did little but cause a few minor holes.

"It makes no difference anyway," insists Webb. "You split a berg in half and then you've got two to worry about instead of one, and one is easier to keep track of."

And if size makes a berg easy to trace, some are almost impossible to lose. The highest iceberg ever recorded reportedly towered 550 feet above water, and that was only one-eighth of it, with the rest submerged.

As the bergs are spotted a crewman makes a notation in symbols on a map of the area being patroled, and the information later is transmitted to New York for analysis and broadcast preparation.

The size and shape of each are indicated on the map which is retained in Argentia, with similar symbols posted on the patrol area map in Governors Island.

A berg under four feet high is called a growler, and the ice-packed sea abounds with them. Up to 20 feet high they are referred to as bergy bits; small berg to 50 feet high; medium berg to 150 feet in height, and large berg, more than 150 feet high.

The patrol duty is tedious and isolated, so the Coast Guard alternates the men at regular intervals. The flight crew is changed every two weeks and the ice observer crew rotates on a monthly basis.

The flights are north from Argentia, which is totally a naval base with no communities near by. The nearest city is St. John's, which is 90 miles east.

A patrol over the frozen wastes of the North Atlantic is as awesome as it is desolate. Small isolated settlements fade away as the plane heads over the ice which glistens like a sugar frosted cake until observers find it difficult to determine the silhouette of a berg in the ice pack.

An occasional commercial vessel is seen below inching its way slowly through the ice fields, and some of the packed ice is literally alive with seals. From above they resemble thousands of fish brought ashore and flailing themselves on a high and dry dock.

And some ice flows are crimson with the fresh blood of the seals after a recent call by a sealing vessel.

The radar informs where a berg may be, but the effort and time for a first-hand view is still the only way to insure safety at sea, the Coast Guard proclaims. □

NEWARK SUNDAY NEWS

Large Tabular Pinnacled Iceberg is 100 feet high, 200 feet wide, and 250 feet long. Note the seas surging around the base.

Thousands of icebergs, recently "calved" from mother glaciers, assemble for the big drift toward the North Atlantic.

Army Helping Oil Men Battle Ice

By WILLIAM D. SMITH
The New York Times

HANOVER, N. H., July 20—This quiet college town nestled in the rolling White Mountains has as its chief tourist attraction the annual Dartmouth College Winter Carnival. Recently, however, a year-round "winter carnival" at a United States Army site just a mile past the Dartmouth campus has attracted its own steady stream of visitors.

The visitors are businessmen. They have come not for fun and frolic but to obtain information from the Army's Cold Regions Research and Engineering Laboratory. CRREL, as the laboratory is called, is considered the greatest center of knowledge on cold and its effects in the Western world.

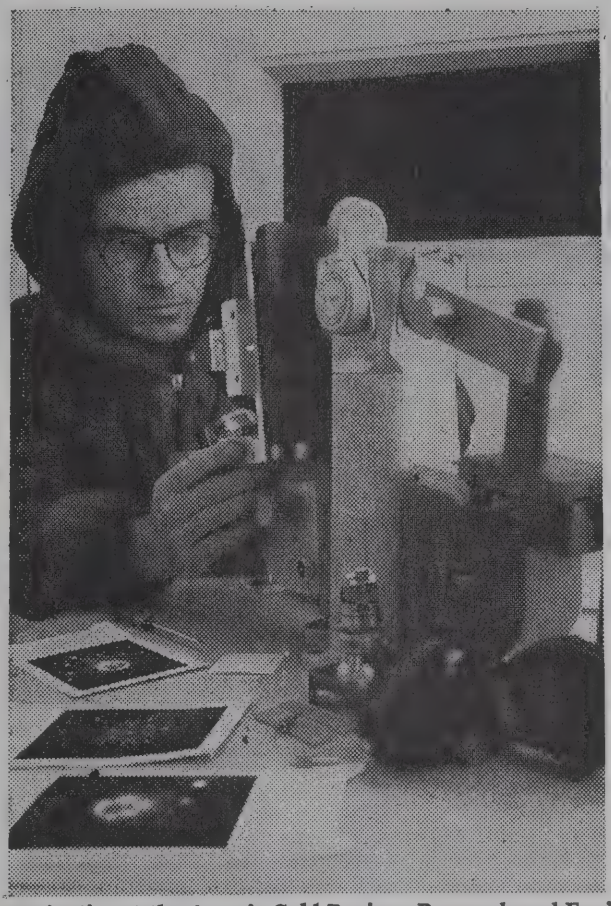
The Army facility labored in quiet anonymity until about 18 months ago.

"About that time we had visits from several oil company executives," CRREL's commanding officer, Col John E. Wagner, recalled.

"Although we normally do not perform work for civilian groups, we do try to answer all questions and tell people where they can go for additional information," Colonel Wagner said. "The questions at first were pretty basic and then became quite specific. It was obvious that something big was up."

The something big was the discovery of what is reported to be North America's largest oil field on the North Slope of Alaska.

With the announcement of the discovery 12 months ago, the Humble Oil and Refining Company, the chief domestic affiliate of the Standard Oil Company (New Jersey), formally asked for CRREL's assistance.



A scientist at the Army's Cold Regions Research and Engineering Laboratory in Hanover, N. H., performs an X-ray examination of a sample of ice taken from Arctic ice sheet.

Colonel Wagner commented: "We have done some civilian projects before and have performed work for other military services on a time-and-material basis.

"Three criteria must be met, however. We must have the personnel available, the Secretary of the Army must give approval and there must be no civilian organization with the capabilities to do the job."

Humble's request for help was approved within 30 days by the Secretary of the Army. "These applications usually take much longer, but the obvious importance to the nation of opening a year-round Arctic sea route speeded up the usual process," Colonel Wagner said.

What Humble specifically wanted CRREL to do was to help the oil company understand sea ice so that the Manhattan and the ships that may follow would be able to make the treacherous passage.

"They came to the right place," Andrew Assur, the laboratory's jovial chief scientist, commented. "We probably know more about sea ice here than anywhere in the world, although the Russians have a much larger facility and many more people devoted to the study of cold regions than we do. They have the quantity; we have the quality," he said with a broad smile.

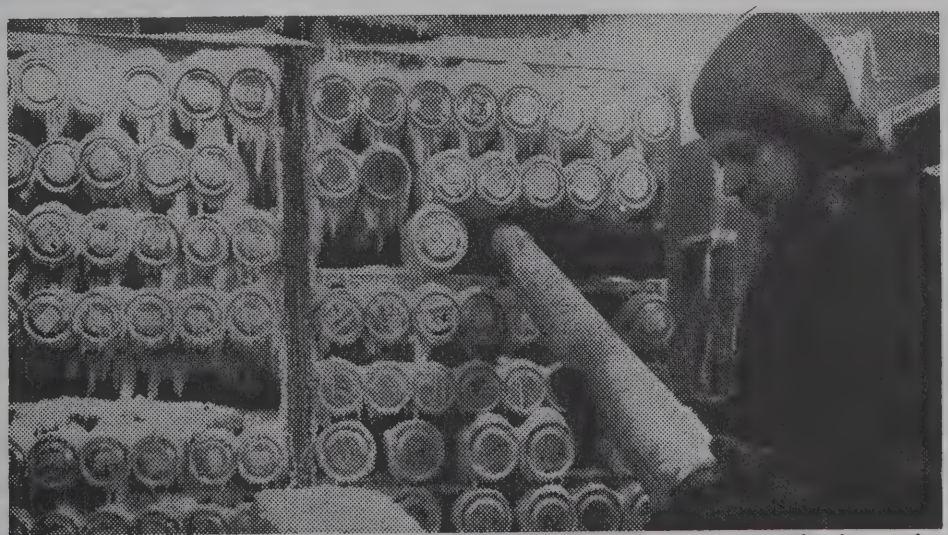
One of the reasons for Dr. Assur's confidence is Willy Weeks, who is considered one of the world's leading experts on the subject of ice. Dr. Weeks, a friendly, unassuming man whose mannerisms give him the appearance more of a high school basketball coach than a world-renowned scientist, commented: "All ice is alike to most people—and that is the way it should be. But there are really many different kinds of ice, each with its various strengths and properties.

"There is pack ice or large blocks of floating ice. Then there is fast ice, or ice that is frozen and immovable. There is one-year ice and old ice, or ice that is an accumulation of several years of freezing and thawing. The strength of ice is dependent chiefly on the brine content, and the brine content is dependent on the temperature.

"The big problem is that each year is a new ball game, and what we know from the previous season is not directly applicable to the new season."

Four men from the CRREL will be going into the Northwest Passage with the S.S. Manhattan although not all four will be on the ship at the same time. Besides Dr. Assur and Dr. Weeks, Guenther E. Frankenstein and Donal E. Nevel will also be on the ship.

To say that the men at CRREL are excited about the trip would be an understatement. As Dr. Weeks commented: "The potential of the Arctic is obvious. Its mineral resources and its strategic location as a trade route are plain to see. It was a question of when. The when is now, and I'm glad I am part of it."



Ice samples are stored at —30° Fahrenheit. Here scientist removes core for inspection.

Major Iron Ore Find

Copenhagen, Sept. 21 (Reuters)—The Danish Cryolite Co. has discovered an estimated 2,000 million tons of iron ore in Greenland. The ore is on the West coast with iron content is about 38%.

The New York Times (by William E. Sauro)

BOUND FOR THE NORTHWEST PASSAGE: The tanker S.S. Manhattan, with an unusual ice-breaking prow, leaving her berth at Chester, Pa., to begin her quest for a commercial route through the polar ice to the oil regions of Alaska.

Tanker Leaves to Conquer Fabled Northwest Passage

By WILLIAM D. SMITH
The New York Times

ABOARD THE S. S. MANHATTAN, Aug. 24—The giant ice-breaking tanker S. S. Manhattan set sail today in a quest to realize a 500-year-old dream —the first commercial ship crossing of the legendary Northwest Passage to Alaska.

Capt. Roger Steward ordered "back slow" from the ship's bridge at 11:15 A.M. and two tugs began to nudge the 1,005-foot tanker out of her berth at Chester, Pa., and into the Delaware River.

The 115,000-deadweight-ton Manhattan is scheduled to spend three months sailing 10,000 miles—over the top of the North American continent and back—through some of the most treacherous waters known to man.

The voyage represents a $40-million gamble by the Humble Oil and Refining Company that a year-round tanker route can be pushed through the Northwest Passage. If successful, the trip could have significant economic ramifications by opening up a shorter water route to the regions of Alaska rich in oil and other minerals.

Stanley B. Haas, a 45-year-old chemical engineer with Humble, heads a 126-man expedition. Included are a volunteer crew of 54 men, as well as scientists, Canadian and American Government representatives, oil company officials and newsmen.

The Manhattan will trace a route that sailors have dreamed of making a commercial trade lane since 1497, when John Cabot searched for a short route to the Orient. Since then, the journey has been tried by adventurers such as Sir Martin Frobisher (1576), Henry Hudson (1610) and Sir William Edward Parry (1818).

Hugging the west coast of Greenland to avoid giant icebergs, the ship will pass Hudson Strait, Davis Strait and Baffin Bay. She will then turn westward into the passage itself, through the Canadian archipelago, following Lancaster Sound, Viscount Melville Sound and McClure Strait into the frozen Beaufort Sea above the North Slope of Alaska.

The Manhattan's voyage, if successful, would promise the following things:

¶A relatively inexpensive transportation link between the oil hungry markets of the Eastern United States and Europe and the Arctic slope of Alaska, where Humble and the Atlantic Richfield Company have made what is believed to be the largest petroleum discovery in the history of North America. Studies indicate that a tanker route through the passage would result in a savings of 60 cents a barrel, or more than a million dollars a day, below the cost of a transcontinental pipeline.

¶A reshaping of world trade patterns. A point less than 500 miles from Prudhoe Bay is equidistant from New York, London and Tokyo, allowing shorter transport routes. The Arctic is also the quickest route to the heartland of Russia.

¶The development of the huge iron sulphur, copper, nickel, lead, silver and other mineral deposits.

¶The biggest shipbuilding boom since World War II. Humble has estimated that 30 ice-breaking tankers would be needed to ply the Northwest Passage route at a cost of $2-billion to $3-billion.

¶The eventual development of a new frontier across the thousands of miles of the Canadian and Alaskan Arctic.

"The Northwest Passage could become the catalyst which opens up the resources of far northern Alaska and Canada to the world," says Charles F. Jones, Humble's president. "A year-round sea route could do in this area what the railroads did for the Western United States — and do it quicker."

The commandant of the Coast Guard, Adm. Willard J. Smith, sent a message today to Michael A. Wright, Humble's chairman.

"In four centuries of exploration in the Arctic," Admiral Smith said," no expedition has been more significant nor promised more potential benefit than the voyage of the Manhattan. It may herald a new era in Arctic transportation. It may unlock a new treasure of natural resources in Alaska undreamed of just a few years ago."

Most Arctic experts seem to agree. John C. Reed, chief scientist for the Arctic Institute of North America, said the Manhattan's voyage, "if successful to its fullest expectations, will give the development of the North a monumental push forward."

A successful passage is probably most important to Canada. Private enterprise, in its drive for mineral wealth, would provide a great portion of the capital investment needed to develop the huge northern part of the Canadian land mass.

To the small body of scientists who have made the study of the Arctic and environs their life work, the success of the expedition holds the key to a new age at the "top of the world."

Andrew Assur, chief scientist for the United States Army's Cold Regions Research and Engineering Laboratories, said: "It would mean an unprecedented flow of money into areas of study that have been long neglected in the competitive struggle for the research dollar."

The new prow, a protective steel belt to withstand the pressure of Arctic ice, and advanced electronic and navigational gear have been added to the vessel.

The new prow will move against the ice at an initial angle of 18 degrees, making it much more effective than standard icebreakers. Conventional icebreakers have a 30 degree prow.

The first ship to negotiate the Northwest Passage was the tiny converted fishing boat Gjoa, which Roald Amundsen, a Norwegian, piloted through the ice-blocked waterway between 1903 and 1906. Since that time, eight vessels have made a successful Northwest Passage.

The latest such voyage was made last month by the Coast Guard icebreaker Northwind, which made the trip from west to east. The Northwind will follow the Manhattan and assist her in her attempt at the passage, as will the Canadian icebreaker John A. MacDonald.

All the ships to have successfully made the passage have been small vessels.

TANKER IS TAKING INSIDE PASSAGE

Icebreaker Avoids Atlantic in Going by Newfoundland

By WILLIAM D. SMITH
The New York Times

ABOARD S.S. MANHATTAN, Aug. 29—The ice-breaking tanker Manhattan today entered the Cabot Strait, heading for the Strait of Belle Isle between Labrador and Newfoundland. This was the same general area reached by John Cabot in 1497 on his first attempt to find a Northwest Passage.

The Manhattan is taking this route not for symbolic purposes but because it is some 200 miles shorter than the alternate route across the Grand Banks around the tip of Newfoundland.

Yesterday the Manhattan dropped anchor at Halifax, N. S., for the first and only harbor stop she will make on her three-month, 10,000-mile voyage. The trip is designed to prove the feasibility of a shorter water route to regions of Alaska rich in oil and other minerals.

Although equipment and personnel pickups will be made at several points on the way, they will be done by helicopter while the ship is moving. The Manhattan's size — 115,000 deadweight tons—and 52-foot draft preclude her from even approaching any of the small harbors on the route.

The stop at Halifax was a courtesy call that lasted eight hours. The Manhattan was acknowledging her entry into Canadian waters and showing her appreciation of the Canadian Government's considerable help on the project.

The ship held open house for Canadian dignitaries, including Adm. John O'Brien, Admiral of the Fleet (Atlantic) of the Royal Canadian Navy.

Several Canadians expressed serious doubts that the Northwest Passage could be opened to shipping.

Adm. Hugh Pullen, retired, of the Royal Canadian Navy, told Stanley B. Haas, the Humble Oil and Refining Company executive in charge of the expedition: "The Davis Strait, even before you hit the passage, will be fraught with danger. It is filled with icebergs and your radar will not always be able to pick them up."

Mr. Haas said he realized the danger but thought the ship was equipped to handle the situation. He added: "I do wish we had forward looking sonar on board, though."

Big Icebreaker Sights the Enemy

By WILLIAM D. SMITH
The New York Times

ABOARD THE S.S. MANHATTAN, Aug. 31—Ice, the enemy, has been sighted.

As the Manhattan left the safety of the Belle Isle Strait and sailed across the Labrador Sea today, giant icebergs began to appear in the distance.

Ice is what the Manhattan came north to find and defeat. It has been man's primary foe in northern seas since seafarers first set out to conquer the Arctic centuries ago; it has crushed hundreds of ships and killed thousands of men.

The Manhattan hopes to crunch through ice thicker than has ever been broken before. Beyond this, and more important, the Manhattan hopes to collect data on the stress and strain on ships in ice.

This data could lead to the building of a new breed of ice-breaking tankers, more than twice as big as the 150,000 displacement tons of the Manhattan to handle whatever the Arctic has to offer.

As the Manhattan crosses the Labrador Sea and starts up the Davis Strait along the west coast of Greenland, she will try to avoid the giant icebergs at all costs. A collision with one of these would be only slightly less calamitous than a locomotive running into a mountain.

A Coast Guard study of several years ago placed the number of icebergs in the Davis Strait-Baffin Bay in August at more than 40,000.

This does not include "bergy bits," which are the size of a house, and the smaller "growlers," named for the noise they make as they toss and turn in the sea.

Growlers are in a way the most most dangerous, according to Capt. Frederick Goettel, a former skipper of an icebreaker and the representative of the United States Coast Guard on board.

"They are dangerous because often the radar can's pick them up when they are hidden by large waves," he said. "Small as they are relative to bergs and bergy bits, they still weigh about 5,000 tons and can give a ship a hell of a whack."

His Canadian conuterpart, Capt. Thomas C. Pullen of the Royal Canadian Navy (retired), also a former icebreaker captain and the representative of his Government, remarked: "Obviously, the next days will be tense and a careful watch will have to be stood by all."

The icebergs are calved from glaciers on Greenland, mostly around Disko Island about half way up the coast. They are carried northward by the West Greenland Current into the northern part of Baffin Bay. Then they swing west and are carried southward by the Canadian Current, and the Labrador Current moves them past Newfoundland into the sea routes of the North Atlantic.

This passage takes about a year and only a few icebergs survive the run. But one giant iceberg was sighted hundreds of miles southeast of Bermuda near the Windward Passage.

For the Manhattan, the real battle will begin in several days when the big ship attacks the pack ice, or huge ice floes that block the Northwest Passage. Here is where the Manhattan must prove that she has the strength and power to crack ice that is more than 6 feet thick.

Radio Teleprinter Ties Icebreaker to the World

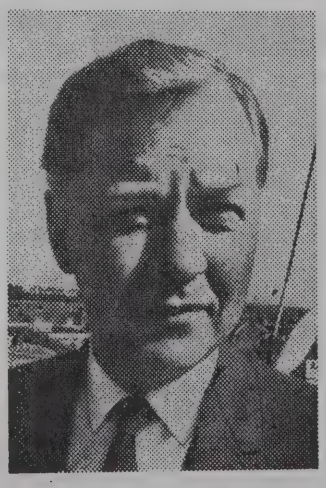
Part of the equipment of the world's biggest icebreaker is a "selective call" teleprinter for news and other messages from the vessel traversing the Northwest Passage to Alaska's North Slope.

ITT World Communications, Inc., said it was the first installation of a teleprinter message and telex service on a United States commercial vessel.

The messages are received by radio at WSL station at Southampton, L. I. The selective calling automatically triggers the teleprinter.

Telex messages are relayed automatically to their destinations. The system even includes old-fashioned Morse Code service.

ITT World Communications viewed this system as a preventive measure against one of the obstacles that made John Cabot Hand enry Hudson turn back in failure — mutiny. Arctic isolation was earlier crews' rebellious moods.



The New York Times

ABOARD THE S.S. MANHATTAN: Stanley B. Haas, left, a chemical engineer who heads the expedition, and Roger Steward, the skipper.

MANHATTAN ENTERS THE BAFFIN ICE PACK

The New York Times

ABOARD THE SS MANHATTAN, at Sea, Sept. 1 — The Manhattan entered the edge of the Baffin ice pack today, giving the giant ship her first experience in ice.

Capt. Roger A. Steward easily moved the ship through the rotted and weakened ice that surrounds the pack. The ship will move deeper into the pack tomorrow, seeking harder ice to test herself against.

Stanley B. Haas, the Humble Oil and Refining Company executive heading the expedition, decided to enter the Baffin pack in order to give the officers and crew some experience in ice before entering the Northwest Passage at the end of this week.

At 11:03 o'clock last night, the Manhattan rendezvoused with a Canadian icebreaker, The John A. MacDonald, at 62 degrees 34 minutes north and 57 degrees 45 minutes west.

Big Icebreaker Crushes Floes in Arctic

The New York Times

ABOARD THE S.S. MANHATTAN, Sept. 2 — The Manhattan sailed cautiously into the Baffin ice pack this morning, but by late afternoon she was confidently and easily crushing through ice more than 15 feet thick.

The giant ship, the largest ever to sail beyond the Arctic Circle, entered the pack shortly after daylight at a speed of 2 knots.

As the dull gray day wore on, Capt. Roger A. Steward gradually increased speed until by late afternoon the 140,000-displacement-ton vessel was battering through the ice at 12 knots.

At a few minutes after 4 P.M., the Manhattan cracked in half a 60-foot-thick ice ridge.

As the ship struck the larger floes, she shuddered slightly. The effect was felt mostly in the aft section.

Walter Devine, the Humble Oil and Refining Company executive responsible for ship design and operation, was obviously pleased with the Manhattan's first real test in ice.

He remarked on the bridge: "It was great, just great. The bow cracked ice just as we expected, and the propellers took the pounding from the broken ice without any difficulty at all."

Ice covers about six-tenths of the area of the Baffin pack, making it look from the air like a pond with thousands of white, aqua and blue lilies—for ice changes color as it ages.

As the Manhattan's big ice breaking prow smashed through the floes, it flipped some on their backs. They showed their blue undersides like landed fish.

As the ship smashed ice, it made a sound as if some giant football linebacker was hitting an equally supersize fullback head-on.

Most of the floes encountered by the Manhattan were made of multiyear ice. As sea ice ages, it gets stronger as the salt content drains out of the floe.

Scientists have established a direct relationship between the decline in salinity of ice and the increase in strength.

Today's penetration of the Baffin pack was a training exercise for the Manhattan's captain and crew.

Manhattan chose the Baffin pack for its first ice test and easily smashed through the biggest floes it had to offer. This was far from winter conditions, but it caused Captain Thomas Pullen, Royal Canadian Navy, retired, a former captain on Canadian icebreakers, to comment: "It was the most awesome display of ice breaking I have ever seen."

Iron is not all that Baffin Island has to offer. The Texas Gulf Sulphur Company has made a lead, zinc and silver discovery on Strathcona Sound, also on the northeastern portion of the island.

On Resolution Island at the southern tip of Baffin, Cominco, Ltd., has made another lead, zinc and silver discovery. Huge asbestos deposits on the northern tip of Quebec as well as the copper discovery on the Coppermine River in western Canada would all receive considerably greater attention if the Manhattan proved that the Arctic could be navigated most of the year.

Maurice W. Rush, chairman of Baffinland Iron Mines and the chief executive officer of the Anglo-American Trust in Canada, said that the development of the Baffinland iron depends on Canadian Government participation.

"Development is too costly for any one company to assume. We need Government help in creating port facilities, communications and other elements of infrastructure."

He added: "We will submit another plan to the Government after we see the results of the Manhattan's voyage."

NOME—Alaska has a longer coastline than the other 49 states put together. And Alaska has 64 per cent of the United States' total continental shelf.

Success of Oil Ship in Arctic Could Aid Metals Development

By WILLIAM D. SMITH
The New York Times

ABOARD THE S.S. MANHATTAN, Sept. 3—Oil money is the moving force behind this giant vessel's attempt to open the Arctic to commercial shipping, but the primary-metals industry has some pretty big dreams taking a free ride on the voyage.

The Canadian and Alaskan Arctic has vast proven reserves of many minerals and the potential for even greater discoveries.

"The key to opening the vast mineral storehouse is transportation," according to Murray Watts, a Canadian geologist and Arctic prospector.

The Manhattan is passing opposite the northeast corner of Baffin Island, where Mr. Watts, in 1962 at Mary River, discovered the largest and richest deposit of iron ore in the history of North America.

Geological and engineering studies were performed by Baffinland Iron Mines, Ltd., an affiliate of the Anglo-American Trust of South Africa, which now controls the property. These studies disclosed that the finds had about 123.5 million tons of 68 per cent iron ore, with few impurities.

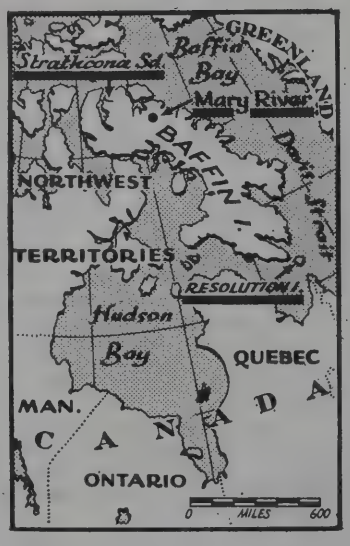
This mineral belt runs for some 400 miles beyond the first discovery area and contains a possible 1 billion or 2 billion tons of high-grade iron ore, according to Mr. Watts. "This would make the discovery the metal equivalent of the North Slope oil find," Mr. Watts said.

Yet nothing has been done since 1966, when a feasibility study showed that the low price being paid for iron ore in world markets and the difficulties of transportation made the development of the area impractical for the present.

According to Mr. Watts, shipping would make the area competitive. "If the Manhattan is successful, it will remove fear, and in the north there is usually nothing to fear but fear itself," he said.

Baffin Island has several large harbors capable of handling big ships.

At present, the shipping season to Baffin Island, the largest island of the Canadian archipelago, lasts only 80 or 90 days each year. The rest of the year, ice closes around the shore.



On Tuesday, however, the Manhattan chose the Baffin pack for its first ice test and easily smashed through the biggest floes it had to offer. This was far from winter conditions, but it caused Captain Thomas Pullen, Royal Canadian Navy, retired, a former captain on Canadian icebreakers, to comment: "It was the most awesome display of ice breaking I have ever seen."

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Canadian 'Shows Flag' on U.S. Tanker in Arctic

By WILLIAM D. SMITH
The New York Times

ABOARD THE S.S. MANHATTAN, Sept. 7 — Ian Watson, chairman of the Canadian House of Commons Standing Committee on Indian Affairs and Northern Development, boarded this giant tanker yesterday and made it clear that the chief purpose of his visit was to "show the Canadian flag."

"These are Canadian waters and I am here to make it plain to all concerned," he said.

Mr. Watson said that his House of Commons committee was extremely interested in the attempt of the 115,000-ton icebreaking tanker to open an Arctic route from the Atlantic to the oil-and-mineral-rich regions of Alaska. He said, however, that his committee had become increasingly concerned over the dangers of possible oil pollution in the event ships were crushed in the Arctic ice.

"The effect on the ecology and environment might be irreparable," he said, adding that his committee was convinced that controls were necessary.

Earlier yesterday, the Manhattan, a 1,005-foot tanker owned by the Humble Oil and Refining Company, easily cut through an ice pack west of Cornwallis Island. The sea was nine-tenths covered with ice, but most of it was annual or one-year ice, the weakest type of sea ice.

The ship accomplished two basic tests in this ice pack. She came to a stop and then started again from a dead halt and also turned about in the ice. Bram Mookhoek, technical coordinator, rated the ship's performance in both situations as excellent.

The ship, which left Chester, Pa., on Aug. 24, is expected to meet her first serious ice conditions near Melville Island, about 150 miles to the west.

The Manhattan has progressed some 200 miles through the Northwest Passage in her attempt to open the passage for year-round use by tankers and ore carriers.

Northwest Passage Opened

By WILLIAM D. SMITH
The New York Times

ABOARD THE S.S. MANHATTAN, Sept. 14—The S.S. Manhattan churned through the Arctic ice this evening to become the first commercial ship to negotiate the Northwest Passage to Alaska.

The 1,005-foot vessel sailed through the Prince of Wales Strait to the Amundsen Gulf in the Beaufort Sea to raise the prospect of a commercial route that merchant voyagers have dreamed of for 500 years.

The Manhattan still has a week's sailing ahead before she reaches Alaska's shore. But she left behind the most awesome ice at around 1 P.M. Eastern daylight time and was sailing tonight in open water as crew members celebrated their passage with a champagne supper.

The big ship has waged a constant battle with ice since she entered Lancaster Sound, the entrance to the Northwest Passage, early on the evening of Sept. 5.

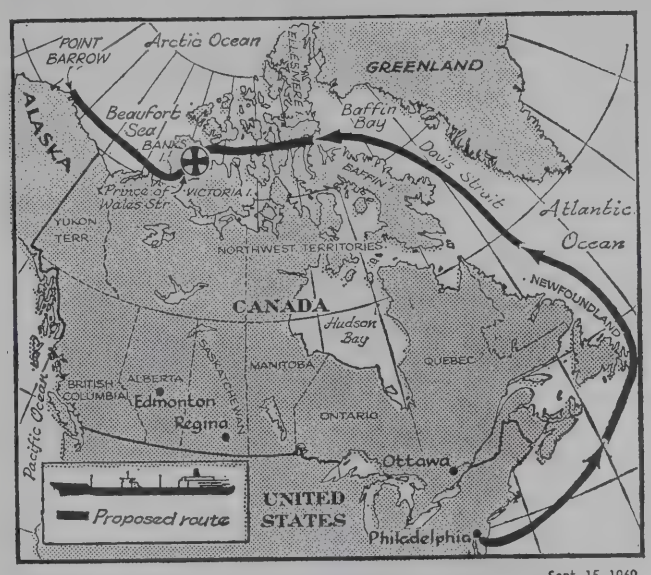
Since then, she has smashed, broken and ground her way through 800 miles of frozen sea with an élan never before seen in the Arctic.

"The Manhattan has put on the most awesome display of icebreaking capability I have ever seen," said Capt. Thomas Pullen, the Canadian Government representative aboard and a man widely acknowledged to be the most experienced ice pilot in the world.

The voyage has been a grueling one for the ship's officers and men, who have been under 24-hour-a-day pressure for much of the trip.

They work to a constant accompaniment of clunking and rasping as ice floes scrape along the ship's sides. They work in what is, for many of them, a strange, alien and dangerous world punctuated by 100-foot icebergs and floes 10 feet thick that extend for mile after mile as far as the eye can see.

Yet, contrary to what might be expected, it is not a colorless world, for at this time of the year a bright sun shining from a brilliantly clear sky highlights the subtle blues and greens of the ancient ice.



The New York Times Sept. 15, 1969

Manhattan negotiated Northwest Passage at cross mark

There is little motion in the specially constructed bow of the Manhattan as it crunches through the ice. Amidships, however, the ship sways like a train riding a roadbed badly in need of improvement. The bulkheads rattle and a passenger feels as if he is flying a small plane through rough weather.

Although the Manhattan has made a mark in history, no one will know until next spring whether her voyage was truly a success.

At that time, all the data gathered from the expedition will have been analyzed and a decision will be made by the Humble Oil and Refining Company on whether to build a new breed of giant icebreaking tankers, designed to open the Arctic to year-round shipping.

While the Manhattan has demonstrated capabilities that have strongly impressed even the most serious skeptics aboard, she has also displayed glaring weaknesses.

The Manhattan first met the ice in Baffin Bay and tested the floes warily. Neither the ship nor her master, Capt. Roger A. Steward, or her two staff captains, Donald Graham or Arthur Smith, had ever sailed the Arctic before.

Sailing an icebreaker requires the captain to forget many of the basic principles of seamanship he has learned through the years.

A skipper is taught to avoid objects in the sea, yet Captain Steward has had to charge huge hunks of ice that in the past he would have sailed miles out of his way to bypass.

The New York Times Sept. 15, 1969

Manhattan could not make it through McClure Strait (1), so diverted to complete Northwest Passage through Prince of Wales Strait (2).

"It is a truly traumatic experience for a good captain unused to these waters," said Capt. Frederick Goettel, the United States Coast Guard representative aboard.

Captain Steward readily concedes that he and his crew are learning as they go about navigating the Arctic.

"I have been more than 30 years at sea in almost every kind of situation including torpedo sinkings, fire, hurricane and, typhoon, but it is all a new ball game up here," the captain observed.

It would have been a new ball game for any captain since never before has a large ship pitted her might against the ice.

The ship has cleanly moved ahead in the ice at about 85 per cent of full power, but only making 3 to 6 knots instead of the open-water speed of 12 to 14 knots at the same revolutions a minute.

This exposed one of the ship's basic weaknesses. While the Manhattan is moving at a fast pace, her 150,000 displacement tonnage generates a velocity that has shattered all but the strongest ice floe.

When slowed the ship is like a powerful fullback who after being knocked off stride by a couple of behemoths at the line of scrimmage is finally stopped by a relatively small safety man.

The Manhattan, with 42,000 horsepower engines, is underpowered for her huge size. If future Arctic tankers are built they will have to be considerably more powerful for this sort of navigation.

The Manhattan's progress through the passage was halted seriously for the first time on Sept. 9 at Cape Providence off Melville Island.

She had slowed up to let the United States Coast Guard icebreaker Northwind catch up. The Northwind, a 25-year-old vessel, had been limping along on five of her six engines.

The Manhattan slammed into a six-foot-high ridge of ice several years old that had been carried down by the wind and tides from the polar pack.

As it ages sea ice loses its salt content and becomes harder, changing color from gray to white and then through various nuances of blue and green.

The Manhattan backed up and charged the ice ridge again with the genuine feeling from officers and men that the ship had broken bigger ridges before.

The situation, however, had changed since ice hummocks covered the horizon as far as the eye could see. There was absolutely no open water visible. To the rear the ship's wake had filled with ice floes within seconds after the aft section passed.

The ship was caught in a 50-mile-square ice field in which the floes were being compressed together by the prevailing northwesterly winds and tides.

Even after the big ship broke the floes there was no place for the huge slabs of ice to go. They just compressed against the ship adhering to her sides instead of flowing away.

Finally, after 12 hours, the John A. Macdonald, the Canadian icebreaker accompanying the expedition, was called to the rescue.

Trailblazer in the Arctic: History Made Informally

By WILLIAM D. SMITH
The New York Times

ABOARD THE S.S. MANHATTAN, Sept. 21—

The Manhattan reached her destination, Port Barrow, Alaska, early today, and her deck was almost as busy as Kennedy International Airport as some 50 dignitaries, including Secretary of the Interior Walter J. Hickel and Senator Theodore F. Stevens, came aboard by way of helicopters for a tour of the ship.

The ship's crew, given their first and only opportunity for shore leave, lined up in a passageway behind the helicopter pad. As the dignitaries filed out of the helicopters, the crew took their places. They landed in groups of eight and set off, cameras ready, to tour the Northern Alaskan port that is the world's largest Eskimo village.

Port Barrow is a town of 3,000 Eskimos, dirt streets, frame houses and nothing to do. The Manhattan's crewmen snapped pictures of Eskimo children in their fur-hooded parkas and they jammed into the town's cooperatives looking for souvenirs. There was little to be had in the wood-paneled shops, where cowboy tunes blared from jukeboxes—some furs, little Eskimo dolls and other Eskimo handicraft—but the men were anxious for something to take home.

It was a chilly day — 20 degrees — and the sky was a dull gray. Most of the Eskimos appeared disposed to be friendly toward the invaders, but one old man in a green parka said that he did not like the ship, which was visible from the streets of the town, because she would be taking away the Eskimo's wealth. The question of ownership of the rich oil fields of northern Alaska has never been finally decided, but the Eskimos say the land is theirs.

The Manhattan was set to sail on her six-week return voyage, during which a great deal of scientific activity, aimed at discovering the basic properties of ice and the ship's capabilities, is planned. Once the dignitaries have departed and the tanker is under way again, life on the Manhattan is likely to revert to the informal pattern set during its east-west negotiation of the frozen straits.

There is, obviously, very little class distinction aboard the 1,005-foot-long Manhattan, which is the largest nonmilitary ship now flying the American flag but a very small place when some 120 men eat, sleep and work together 24 hours a day. There is little spit and polish — the men do their jobs well, and that is all that is asked of them.

There is a crew mess and an officers' mess, but the food is identical. The principal difference between the two is that the officers' place setting includes a tablespoon as well as a soup spoon. Everyone eats in his designated mess, but the social interchange between officers and men, as well as with the scientific observers and others on board, is free and easy.

Except for the master, Capt. Roger A. Steward, and his two staff captains, Arthur Smith and Donald Graham, all exchanges are on a first-name basis. And sometimes even for the captains it's Roger, Smitty and Don.

Ice Scientists' Day: Seeking Polar Data

By WILLIAM D. SMITH
The New York Times

ABOARD THE S.S. MANHATTAN — Every morning they clamber over the side of the ship like a plantoon of marines getting ready for an assault on a Pacific island.

With almost military precision, the ship's team of 14 ice scientists and engineers thus go through the daily routine of gathering the data that will ultimately decide whether or not the Northwest Passage will be opened as a year-around trade route.

The program starts when the ship deliberately noses into an ice flow and stops its engines. The floe had been picked out the previous day by aerial reconnaissance because of some special ice characteristic.

Within minutes after the ship stops the scientists are on the ice and awaiting their equipment. Four bright orange sleds containing augers, picks, instruments and rifles are passed by hand over the side.

The rifles are in case of an attack by a polar bear. No one wants to kill a polar bear. In fact, that would be a last resort. But the big animals have no natural enemies and would just as well swat a scientist for dinner as a seal.

The ship's chief mate, Davis Abernathy, then has the deck crew lower by winch the ship's two skee doos. The skee doos, or snowmobiles, are used to haul the equipment to the drilling sites. Even Eskimos now use these fun-to-drive motorized vehicles rather than dog sleds as the chief means of locomotion over snow and ice.

The sleds are tied to the snowmobiles and driven to locations previously designated by the chief of the ice study group, Günther Frankenstein.

In addition to Mr. Frankenstein, the ice study group contains four other highly regarded scientists, Dr. Charles Swithinbank of the Scott Polar Research Institute at Cambridge University, and Dr. Andrew Assur, Dr. William Weeks and Donald E. Nevel of the United States Army's Cold Regions Environment and Engineering Laboratory.

They are assisted by 10 engineers from the University of Alaska headed by E. B. Rice, the former head of the school's civil engineering department.

Günther Frankenstein, who heads the ice study, holds drill used for core samples.

The ice parties trek across the hummocked, snow blown ice scape, carefully placing markers every 100 feet along the way.

By twos and threes the individual study groups drop off until only Mr. Frankenstein and two assistants are left 6,000 feet in front of the sharp prow of the ship.

The drilling begins with the men heavily bundled in their down parkas and mittens. Within minutes, however, the parkas are open, for drilling by hand in ice 6 to 20 feet thick is hard work—even in this climate.

Mr. Frankenstein does not have to worry about opening his parka, for he never wears one. His work clothes are a sweater and light wind breaker. When one of the ship's officers remarked about Mr. Frankenstein's attire, the scientist replied, "Don't worry, I wear a parka when it gets cold. But it hasn't even dropped to 15 below yet."

The ice parties perform three basic tests. They measure salinity and temperature, the two most important data points for discovering ice strength.

This is done by taking a three-inch-diameter core sample of the ice. The core, which on occasions has measured more than 12 feet deep, is cut into six-centimeter units and tested for temperature. These samples are then put into plastic containers, each carefully marked as to its relative depth position in the core, and brought back to the laboratory to be analyzed for salinity.

At the same locations, a two-man team makes an on-

the-spot measurement of the ice strength, using an instrument that is calibrated to gauge the deflection each ice sample makes in a wire ring. Another two-man team drills holes and simply measures ice thickness by dropping a tape measure through the opening.

A study of a 6,000-foot course in front of the ship takes four to six hours, depending on ice thickness.

Lunch is usually served at the drilling sites, and for those who like picnicking on ice with the temperature hovering around 15 above zero, the fare is quite good.

The basket's contents range from Rock Cornish game hens to ham sandwiches. Twelve slices of ice cream were slipped in on one occasion. Mr. Frankenstein had two slices for dessert, and four other scientists partook of the unusual gastronomic opportunity of eating ice cream on a 25-mile square ice floe only 50 miles away from the magnetic North Pole.

After the tests are complete, the ice parties pack up their gear and trudge wearily back to the ship.

The next step of the program calls for the ship to plow through, or try to plow through, the ice course marked out by the scientists.

The Naval architects and marine engineers on board then take over the data-gathering task by recording carefully the ship's velocity, propeller revolutions and other pertinent data as the Manhattan passes through the different ice conditions.

Whatever happens, the ice parties will have gathered basic scientific data on an area that has never before been studied at this time of the year.

In past years all ships, even ice breakers, have moved out of the Viscount Melville Sound by late September because of the danger of becoming ice-beset as temperatures begin to fall.

The Manhattan and the other ships of the expedition, the United States Coast Guard ice breaker Staten Island, and the Canadian ice breakers, the John A. MacDonald and the Louis St. Laurent, decided to take their chances until the close of October.

It was possible, but not probable that the ice could lock the expedition in until next spring. Dr. Assur found this bleak prospect not unappealing. He commented only half in jest: "Just think what a magnificent laboratory this ship would make for a study of the Arctic."

The New York Times (by William D. Smith)

Canadian icebreaker John A. MacDonald, viewed from the deck of the tanker Manhattan

Icebreaker Back From Pioneer Alaska Trip

By WILLIAM D. SMITH
The New York Times

HALIFAX, N. S., Nov. 8—The Tanker Manhattan steamed into Halifax Harbor shortly before noon today, accompanied by a fleet of 20 Canadian Government and local yacht club vessels.

For the big American icebreaking tanker it was the first harbor stop since she put out from this port, 71 days ago.

During this time she traveled 10,000 miles over the top of the North American Continent and back to become the first commercial ship ever to conquer the legendary Northwest Passage.

The real reason, however, is to pay homage to the Canadian icebreaker, the John A. Macdonald. The "Johnny Mac," as the vessel is called by the crew of the Manhattan, started out on the expedition as just another member of the supporting cast, but she earned co-star status by her performance on the voyage. The sturdy veteran of 10 seasons in the Arctic freed the Manhattan from ice on at least 12 occasions.

Without the assistance of the Canadian vessel it possible that the Manhattan would not have successfully completed her mission. The big American ship could have been stuck in the ice.

A reception was held for the crews of the Manhattan, the MacDonald and the Louis St.-Laurent, another Canadian icebreaker, at Dalhousie University. After the reception the sailors from the three vessels went out on the town. From the Lord Nelson Hotel to the waterfront bars on Barrington Street, there were groups of seamen celebrating the completion of this historic voyage.

A bond developed between the crews of the Manhattan and the Johnny Mac during the voyage.

The Johnny Mac lost a blade on one of her three propellers coming through the Prince of Wales Strait during the east-to-west passage. She sent this message to the Manhattan: "We have damaged a blade but are fully capable of doing our job. We are ready, willing and able to go anywhere and do anything the expedition decides is necessary."

The chunky Canadian vessel also plowed her way to a helicopter that had fallen on the ice, retrieving the damaged craft and crew. Helicopters were used by scientists on the trip for exploration and to maintain communication with the rest of the world.

The Canadian craft were also popular with thirsty American visitors. American ships traditionally serve no alcoholic beverages. No such restriction exists for the Canadians.

The skipper of the Johnny Mac is Capt. Paul M. Fournier. The icebraker is 315 feet long and has a displacement tonnage of 8,974. Her shaft horsepower is 15,000, giving the Canadian ship one-third the power and length of the Manhattan and only one-sixteenth the displacement tonnage of the American vessel.

What the Macdonald lacks in size, though, is more than made up in maneuverability, hull shaps and power-per-ton-of-displacement.

The Johnny Mac is beautifully appointed on the inside. The officers' and crew's lounges are wood-paneled and have wood fireplaces.

The 96 men who sail the Johnny Mac belong to the Canadian Coast Guard, but they are not in the military service. The Coast Guard is part of the Department of Transport and as such is a civil service operation.

The crewmen sign on for a voyage and can leave at the end of it. Nonetheless, ther is a high esprit de corps. The crew proudly wears black berets with the ship's patch.

The Manhattan is scheduled to depart tomorrow on the last leg of her 10,000-mile, 80-day passage.

MANHATTAN DOCKS IN NAMESAKE PORT

By WILLIAM D. SMITH

The New York Times

Nov. 13

The S.S. Manhattan, the first commercial ship to conquer the legendary Northwest Passage, sailed triumphantly into New York yesterday, to the traditional tears and cheers, along with the fireboat welcome.

The tears and cheers came from the wives and families of the 56 men who sailed the giant, 1,005-foot vessel over the top of the North American continent and back.

The purpose of the 80-day, 10,000-mile voyage through ice-covered seas—more unknown than the surface of the moon—was to demonstrate and gather data to prove the feasibility of shipping oil from the vast reserves on the North Slope of Alaska through the Arctic to population centers on the East Coast of the United States and in Europe.

The Manhattan did not escape the ice unscathed. Several hull sections were cracked, including the Number 4 cargo tank which had a hole "big enough to drive a bus through," a company official said. The damage occurred on sections that had not been specially refitted with high-tensile steel for the trip to the Arctic.

Whether or not the sponsors of the $40-million expedition, the Humble Oil and Refining Company, the British Petroleum Company and the Atlantic Richfield Company, will cry of cheer will not be known until the middle of 1970, when all the data gathered on the trip will have been analyzed.

The decision will then be made on whether or not to build a new breed of massive ice-breaking tankers.

If the computers show that tankers can make it through the ice-blocked passage 12 months a year, Humble has estimated, it would cost 90 cents or $1 to ship a barrel of oil to the Eastern United States. This would be 35 to 45 cents cheaper than alternative methods, such as a transcontinental pipeline from Alaska across Canada or the United States, or a combination of tankers and a pipeline.

J. K. Jamieson, chairman of the Standard Oil Company (New Jersey), Humble's parent company, said yesterday that estimates indicated that more than 30 billion barrels of oil are on the North Slope, making it by far the largest known field in North America.

For both the big ship and her crew, yesterday was likely their last day of glory.

The crew, for the first time in their lives as merchant seaman, had been in the spotlight. They enjoyed it, and developed an espirit de corps that many military units would envy.

As the crew was saying goodbye, a Humble official jokingly asked, "When is the first reunion?"

Jim Barrett, a deckhand, answered, "This is the merchant marine. We're just sailors. We don't have reunions."

Submarine Fleet Urged for Alaskan Oil

By WILLIAM D. SMITH

Dec. 17

The multibillion - dollar sweepstakes to devise an economic and practical means to move the vast oil deposits of Arctic Alaska to East and West Coast population centers got a new entry yesterday as the General Dynamics Corporation proposed the building of a fleet of nuclear-powered submarine tankers.

Another project to move the North Slope oil cleared the final hurdle in Washington as the House Interior Committee voted to allow a permit to be granted for the construction of a $1-billion 800-mile pipeline from Prudhoe Bay to the ice-free port of Valdez in the South.

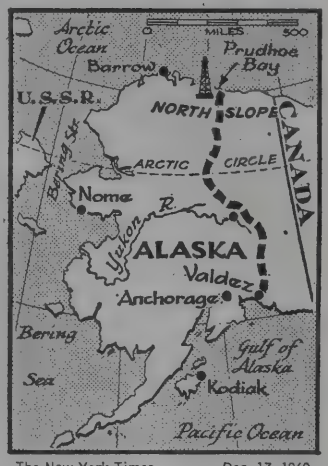
The Senate and the Interior Department had already cleared the project, which is the only Alaskan transportation proposal that has definitely been approved by the oil companies.

The project had been held up because of an Interior Department refusal to permit the use of Government lands in Alaska until native claims on the territory were settled. The proposal approved in Washington modifies the ban but keeps the construction of the line under tight Federal control.

The measure has been opposed by conservationist groups.

The pipeline to Valdez would satisfy West Coast needs but the General Dynamics proposal was aimed at supplying the demands of the East Coast.

General Dynamics said that it had made proposals to five oil companies to build the submarine fleet that would move the oil under the ice of the Northwest Passage to an Atlantic coast port where the petroleum would be transferred to conventional tankers.



The New York Times Dec. 17, 1969

Roger Lewis, president of General Dynamics, who has taken a personal interest in the project, said that the proposals were made after extensive technical feasibility and cost evaluation studies showed the submarine to be "a practical and economically attractive means for moving Arctic oil."

Mr. Lewis declined to announce a price for the first-of-a-kind vessels. The company did say that a round trip between Prudhoe Bay and an ice-free port on Greenland would take two weeks, including loading time.

Each submarine tanker will be capable of carrying 1.2 million barrels of oil. The ship will be 900 feet long, with a beam of 140 feet and a hull depth of 85 feet. Its twin screws would give it a speed of 18 knots.

Proposals were submitted to the Standard Oil Company (New Jersey), the Atlantic Richfield Company, the Mobil Oil Company, Standard Oil Company (Ohio) and the Phillips Petroleum Corporation. Jersey Standard and Mobil said they were considering the proposal.

The oil companies also are considering moving the oil by surface tanker, a route that was tested by the S.S. Manhattan this fall. Estimates have put the cost of an ice-breaking surface vessel at around $35-million to $50-milion and an economic round-trip time between Prudhoe Bay and an East Coast port at about 35 days.

The cost of a submarine tanker would likely be considerably more but it would have the advantage, if it is found feasible, of reliability and quicker delivery.

Transcontinental pipelines also have been suggested as a means of moving the oil. Mr. Lewis said:

"Our work shows that the submarine tanker will achieve substantially lower costs for moving the oil to the United States East Coast than those attributed to projected pipeline projects."

He added that in addition to servicing the United States and Canadian East Coast markets the submarine could operate under the Arctic ice to serve Europe.

Mr. Lewis said a submarine would be virtually immune to environmental hazards such as ice, fog and storms.

A commercial submarine route under the Arctic ice was first suggested by Sir Hubert Wilkins, an early polar explorer, during the nineteen-thirties. He even attempted a voyage in a small vessel.

Industry sources say that General Dynamics has been studying the potential of underwater cargo vessels for more than 10 years.

TESTS BEING STUDIED ON SEA ICE IN ALASKA

WASHINGTON — Ice experts are studying the results of a six-week field survey of sea ice pressure ridging (ice mountains) conducted in the ise pack off Point Barrow, Alaska.

The Army Terrestrial Sciences Center conducted the study, assisted by Coast Guard and Navy personnel and special Arctic aircraft from the Arctic Institute of North America.

The spring season was chosen to study the sea-ice in its maximum development after the Arctic winter, and to make the results of the study available for extensive Government and industry tests planned this summer.

The Coast Guard is testing and developing designs for Arctic icebreakers and research vessels. The United States and Canadian Governments and private industry are investigating the possibility of year-round maritime operations through the "Northwest Passage."

The objectives of the study were to make detailed measurements of surface and subsurface geometry, to obtain mechanical strengths of individual ice ridges and to observe distribution patterns of ice pressure ridges on a regional basis.

An Oil Bonanza—but the Problem Is to Get It Out

"Alaska will never be the same." That was the reaction of Alaska's Governor, Keith H. Miller, to the state's Sept. 10 sale of oil leases for a record-breaking $900-million.

The oil industry may never be the same either. The vast amount of money poured into the lease sale underscored earlier evidence that a major new source of oil has been found on Alaska's North Slope.

The North Slope is a bleak, frozen stretch of land that tapers down from the foothills of the Brooks Range, the northernmost limits of the Rocky Mountains, to the waters of the Arctic Ocean.

When Alaska sold oil exploration leases on the North Slope in 1965 and 1967, they went for $13 to $15 an acre. This month's sale of leases on 450,000 acres produced an average return of $2,182; one tract was leased for $28,233 an acre.

For Alaska, the nation's largest and poorest state, the lease sale meant a touch of instant prosperity. The proceeds were equal to six times the state's current annual budget.

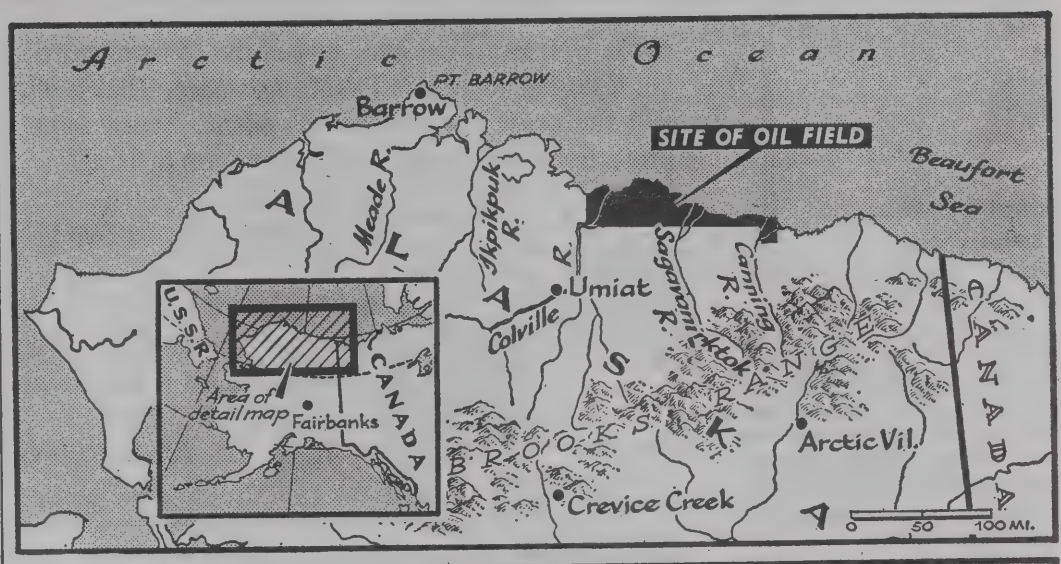
The North Slope oil rush began quietly in January, 1968, when the Atlantic Richfield Company announced the first discovery well in the Prudhoe Bay area. Its partner in the venture was the Humble Oil and Refining Company, a subsidiary of the Standard Oil Company (New Jersey).

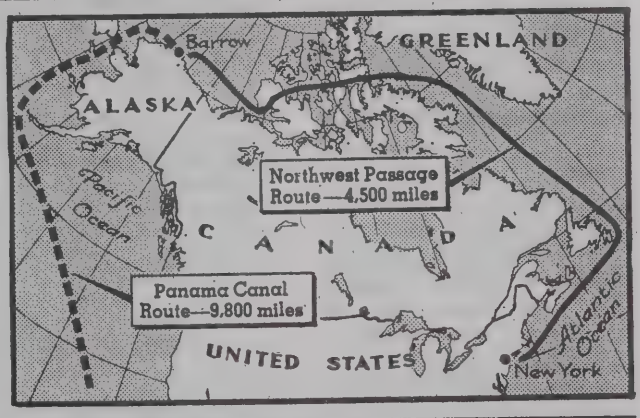
The companies announced a second discovery well a few months later and then, in July, 1968, astounded the oil industry with a report that tests of the discovery area indicated that it held reserves of 5-billion to 10-billion barrels of oil. The North Slope thus represented the largest oil discovery on United States territory since the huge East Texas field in 1930.

It also meant that total oil reserves of the United States, then estimated at 32 billion barrels, had been increased by 15 to 30 per cent.

Even if the North Slope proves as fruitful as expected, it will be at least three years before the oil begins to move to markets. It will take that long not only to bring the North Slope into full production but to build the pipelines and tankers that will carry the oil to market.

The costs of the pipeline and tanker projects will match, and perhaps exceed, the money already put into the North Slope by the oil industry.





In an effort to find a cheaper way to ship oil from the newly discovered fields in Alaska's North Slope (top map) to the East Coast and Europe, an ice-breaking tanker is plowing its way through the Northwest Passage (solid line on map at right) in an historic voyage. This route would be less than half as long as the one through the Panama Canal (dashed line).

The New York Times

Hickel Approves Oil Road for Alaska

By WILLIAM M. BLAIR
The New York Times

WASHINGTON, Aug. 14—Secretary of the Interior Walter J. Hickel announced today that he had granted permission for three oil companies to build a 53-mile road in Alaska in connection with a proposed 800-mile pipeline to tap the state's new oil discoveries.

He cautioned, however, that the performance of the road builders to protect the environment would have a direct bearing on granting their application for construction of the $900-million pipeline.

The Secretary said in a statement:

"The road section from Livengood to the Yukon River will be regarded as a show piece to the nation [demonstrating] that the fundamental questions arising from the impact of modern technology upon a delicate economic system can be resolved without detrimental effect upon the environment or the native peoples."

"I want to emphasize that the performance on this road construction will bear direct relevance to our subsequent response to the 800-mile pipeline application," he said.

"It should also be firmly understood," Mr. Hickel continued, "that modification of the freeze for the 53-mile segment in no way predetermines, nor commits the Department of the Interior legally or in principle, to future action on the pipeline right-of-way."

Permission for the road came through modification of the department's land freeze order which all of the Federal domain in Alaska is sequestered until the land claims of Alaska's natives, Eskimos, Indians and Aleuts are settled. The issue is now before Congress.

The road will be constructed by the Trans-Alaska Pipeline System, a consortium of the Atlantic Richfield Oil Company, the Humble Oil and Refining Company and the B.P. (British Petroleum) Company.

Atlantic Richfield made the first big strike on the north slope of Prudhoe Bay last August. The field is estimated to have as much as 10 billion, barrels of oil, one of the largest fields in the world.

The road will be an access to the pipeline route during construction. No road exists north of Livengood over the permanent frost that poses unusual and severe construction problems.

Alaska to Open Winter Road

FAIRBANKS, Alaska, Nov. 28 (AP)—A winter road from Livengood to Alaska's oil-rich North Slope is to be reopened this winter, Gov. Keith Miller said yesterday in a commitment to a permanent road to the North Slope. The highway will cost an estimated $1.2-million for proper reopening and maintenance.

Aleutian H-Bomb Is Fired Without Damaging Quake

By WALLACE TURNER
The New York Times

AMCHITKA ISLAND, Oct. 2—The controversial underground test of a hydrogen bomb was carried out today as planned on the south end of this island. A strong ground motion, lasting about 40 seconds, shook the control center 40 miles away.

The authorities here said that this had not been caused by any earth slippage triggered by the blast. The motion was caused, they said, by the fact that the shock waves reached this point by reflection from different levels beneath the earth and so arrived at different times.

Aerial sweeps and remote reading of instruments showed no escape of radioactivity one and a half hours after the test.

The weapon fired was reported to be 1.2 megatons in force.

[In Washington, the Atomic Energy Commission said that the test had not triggered tidal waves or a damaging earthquake, United Press International reported.]

Critics of the test had argued that it might touch off a severe earthquake and tidal wave. The western Aleutians, where this island is situated, is a seismically active area.

Reports were not yet available from the extensive set of ecological experiments that were a part of the test. Some opponents of the project had objected that the shock might upset life balance and endanger such species as the sea otter.

The bomb, fired at 12:06 P.M. Bering Sea time, 6:06 P.M. Eastern daylight time, caused the earth at ground zero to rise considerably. The structure over the 4,000-foot shaft where the bomb was buried survived the shock.

One remotely controlled television camera was focused on a known slippage point called Rifle Range Fault. Water and mud could be seen floating from it as the pressures seemed to force it to slip.

It appeared that slippage might have occurred, but no positive information will be available until a later physical inspection.

The cost was about $125-million for building the construction camps, drilling the holes for this and two future shots and firing this test. Remoteness of the site increased costs greatly, so that this test cost perhaps twice as much as a similar one would have in the Nevada desert.

The New York Times Oct. 3, 1969

The culmination of this effort occurred in one-tenth of one-millionth of a second as the components of the bomb were forced together and the explosion occurred, creating temperatures of millions of degrees that vaporized thousands of tons of rocks.

The earth shock caused a shower of rock above, and as the cavity pressure lowered, the ceiling progressively collapsed. This frequently produces the crater effect typical of underground tests of big bombs.

The shot was fired in weather that was unusually benign for the Aleutians. After a series of rainstorms, the skies cleared, and the sun was shining at blast time. Winds were at 17 miles an hour, and the temperature was 42 degrees.

The bomb called Milrow, with 1.2 megatons of power, was designed as a match for one called Boxcar, which was fired in April, 1968, in the Nevada desert. Scientists and the Atomic Energy Commission have decided that weapons tests of larger magnitude must be moved away from Nevada, where they may have adverse effects on Las Vegas, 100 miles from the Boxcar site, and Salt Lake City, 250 miles away.

The decision to use Amchitka for bomb tests in the range of two megatons and more has been contested by groups in Alaska and elsewhere. A megaton is equal to the force of a million tons of TNT.

The critics argued that the test of the 1.2-megaton Milrow could trigger an earthquake in the fault that runs beneath the Aleutian Ridge and back to mainland Alaska.

They said that bomb testing, even underground with the radioactivity contained in the earth, was bad and constituted a needless contamination of the environment.

They also believe that the next weapons tested will be upward of two megatons in power, and that these bombs are designed for the controversial antiballistic missile system.

Thus, the opposition to this test allied the antiwar, anti-bomb, anti-A.B.M. group with the naturalists and the conservationists who oppose environmental contamination.

Many exploitation-oriented Alaskans who normally support the military but are afraid of earthquakes and tidal waves also opposed the test.

The Atomic Energy Commission responded with an extensive public information campaign. This was limited, however, by the logistic problems of operating from this isolated place.

Amchitka is 1,400 miles from Anchorage. Few Alaskans have seen the island. The nearest inhabited places are islands 200 miles away, Shemya to the west and Adak to the east.

Until four years ago, no one lived here after troops left at the end of World War II. The south end of the island is littered with hundreds of old Army buildings, and there is a heavy scar on the tundra where in 1965 the Department of Defense held an 80-kiloton bomb test called Longshot.

The commission installed a public information office in a room on the ground floor of the Anchorage Westward Hotel. Pamphlets were given away. Movies were shown. Questions were answered.

The commission also provided quarters aboard the aircraft carrier Princeton for news reporters wanting to come to the island as soon as possible after the blast. The Princeton has been cruising 10 miles offshore for several days.

Representative Chet Holifield, chairman of the Congressional Joint Committee on Atomic Energy, came to Amchitka on Tuesday.

"I've been familiar with the careful planning for this and I have every confidence it is completely safe," the California Democrat said then. "So it seemed to me I ought to show this by coming here."

The public relations concern arose in part because the testing program needs Amchitka. No realistic alternative is believed to exist anywhere else on American soil. There had been a suggestion that the tundra of the frozen North be used, but that was before heavy oil strikes were made there.

Scientists working on the program were confident that Amchitka would come through the tests without major incidents. They were also confident that the island would prove to be a suitable test site for hundreds of bombs far beyond the range that could be tested in Nevada.

Dr. William Ogle, scientific adviser to the test manager here, was asked in an interview how many megatons in one bomb the island could withstand. He replied, "I'm sure the number is tremendously larger than anyone in the United States will ever want to test."

SAN FRANCISCO, Oct. 22—Minor effects have been observed from the Oct. 2 hydrogen test underground at Amchitka Island in the Aleutian chain, the Atomic Energy Commission said today.

The A.E.C. announcement of effects of the test earlier this month noted that it registered a shock of 6.5 on the Richter scale of earthquake intensity. An earthquake of this size could cause minor damage.

The commission said damage to the island terrain was minimal. It consisted of cracking of fill sections in roadways, some rock slides and earth slumps along cliffs, and slight displacements of temporary buildings, the agency said. It added that two water pipes were broken, there was no damage to the airport or harbor, and no fault slippage was observed on the surface.

The building above the bomb site, put up to protect the site from the weather, survived the shock. The explosion was 4,000 feet below the surface in solid volcanic rock. The surface subsidence at ground zero created a saucer hundreds of feet in diameter and 20 feet deep in the center.

The ground shock, fairly strong at the northwest end of the island 28 miles from the blast, was barely perceptible on Adak, another Aleutian island 200 miles to the east. The tsunami (sea wave) from the shock was about two inches high.

No radiation levels above natural background radiation were found, the commission said.

Trudeau Reaffirms Canadian Sovereignty in Arctic

By JAY WALZ
The New York Times

OTTAWA, Oct. 23—A new session of Parliament opened today with the Trudeau Government reaffirming Canadian sovereignty in the Arctic and promising strong antipollution measures to preserve the "state of nature" existing there.

The traditional Speech from the Throne, read by the Governor General, Roland Michener, but prepared by Prime Minister Pierre Elliott Trudeau, claimed for Canada the "exclusive right to explore and exploit" resources of the North American Arctic islands and the adjoining continental shelf.

The speech was silent on the controversial matter of ownership of the seaway—the Northwest Passage—through the archipelago. Aides to Mr. Trudeau said that this would be taken up specifically in a policy paper to be issued soon.

Mr. Trudeau in the past has not yielded to opposition pressures that he state Canada's claim to ownership and control of the waters, as well as the land. Today's speech, however, disclosed the Prime Minister's intention to take all possible steps to control traffic in the interest of the fight against pollution. The United States has insisted that the Northwest Passage is international waters.

The status of the Northwest Passage is a topical concern in Canada because of the recent discoveries of oil on the North Slope of Alaska. The successful passage of a huge United States oil tanker, the Manhattan, through the ice-coated Arctic seas has opened the prospect of developing this difficult lane as a shortcut to the oil markets in the United States and Europe.

Members of Parliament were told today that the Arctic Ocean and its coastal regions might soon enter a period of rapid economic development. The speech noted, however, that with the benefits of such a development, there could also be a danger of pollution. This could disturb the balance of plant and animal life which was said to be particularly precarious in the harsh polar regions.

While encouraging development, the Government told Parliament, "we must fulfill our responsibility to preserve the areas, as yet undespoiled and essentially in a state of nature."

"The Government will introduce legislation setting out the measures necessary to prevent pollution in the Arctic seas," the speech pledged. "It is also considering other methods of protecting Canada's ocean coasts."

TRUDEAU, THANT CONFER ON ARCTIC

Canadian, at U.N., Depicts Plans to Bar Pollution

The New York Times

UNITED NATIONS, N. Y., Nov. 11—Prime Minister Pierre Elliott Trudeau discussed with Secretary General Thant today Canadian plans to assume prime responsibility for preventing the pollution of the North American Arctic.

The Canadian leader expressed an interest in the antipollution activities of nearly a score of United Nations study groups. However, he expressed a special concern over the dangers of pollution in the Arctic, whose hundreds of islands belong to Canada.

Through Mr. Thant, Mr. Trudeau said, he hopes to direct United Nations attention to the need for prompt antipollution action in the Arctic and thus to take a step toward Canadian stewardship, if not sovereignty, over the waters around the Arctic islands.

In Ottawa, the Prime Minister has made known his view that the recent voyage of the tanker Manhattan through the Northwest Passage raises immediate questions of rights and duties in the Arctic islands and the waters surrounding them.

The status of the Northwest Passage—the sea lanes through the Arctic archipelago—has never been settled in world councils. The United States views the passage as an international waterway. Canada long ago asserted sovereignty over the islands, but has not taken a firm position on the surrounding waters.

Today Mr. Trudeau stressed the urgency of conservation measures because of the Manhattans voyage.

While the Canadian Government cooperated with the voyage, undertaken by the Humble Oil Company, a United States concern, it is disturbed by the prospect of uncontrolled use of the northern sea lanes by countries not concerned about pollution.

In a news conference before returning to Canada, Mr. Trudeau said, "We owe it to the world to do something" on pollution.

The Prime Minister considers the Canadian islands the "world's last big natural reserve."

A strangely abundant life exists "so precariously" there, he told the House of Commons recently, that a fraction of the pollution tolerated in the more temperate zones could cause devastation.

According to Mr. Trudeau's advisers, one large oil gush or a tanker accident could despoil a vast area for years and kill off generations of fish and birds. Oil on ice, or frozen oil is slow to disintegrate or evaporate. It cannot seep down into the permanently frozen subsoil and on the surface the cold preserve it.

Arctic conditions tend to preserve all kinds of manmade waste, according to A. H. Macpherson of the Government's wildlife service. Most of the year there is no freely flowing water to carry off sewage. Underground installations are impossible in the permafrost, so septic tanks are ruled out.

The open "sewage lagoon" built a few years ago to meet the sanitation needs in a government town of 3,000 is overflowing.

Trash degrades imperceptibly. Recent explorers said that cans of food, such as pemmican, left in the Arctic in the last century are still palatable.

But nature's products, both plant and animal, are easily destroyed, Mr. Macpherson said. All life depends on a growing season confined to July and August. Then the Tundra bursts in a profusion of miniature bloom. But it takes 20 to 50 years to replace the tundra destroyed in a day by a bulldozer or truck.

Canadian Researchers to Sail Ship Around Both Americas

OTTAWA, Nov. 15 (UPI) — The Canadian scientific ship Hudson will leave Halifax, Nova Scotia on Wednesday on the first attempt to circumnavigate North and South America.

The year-long voyage — through the windswept seas of the tropics and Cape Horn and the ice-clogged Canadian archipelago — is for the purpose of oceanographical research.

John J. Greene, Minister of Energy, Mines and Resources, announced final plans this week for the Hudson's expedition of more than 14,000 nautical miles. A statement from his office described the trip as Canada's "first major oceanographic expedition on a world-ocean scale."

In addition to general oceanographic data, Mr. Greene's office said, the Hudson venture would also "yield valuable knowledge of the resource potential of Canada's continental shelves on the Pacific, Arctic and Atlantic coasts."

The Hudson's crew will include up to 100 scientists from the Fisheries Research Board of Canada and other Canadian Government and university laboratories. Scientists from the United States, Argentina and Chile will join the ship at various ports of call as it travels through the waters of four oceans—the Atlantic, Antarctic, Pacific and Arctic.

The Hudson, flagship of the oceanographic fleet of Mr. Greene's department, is designed for both ice-breaking and steadiness in heavy seas. She has a cruising range of 15,000 miles.

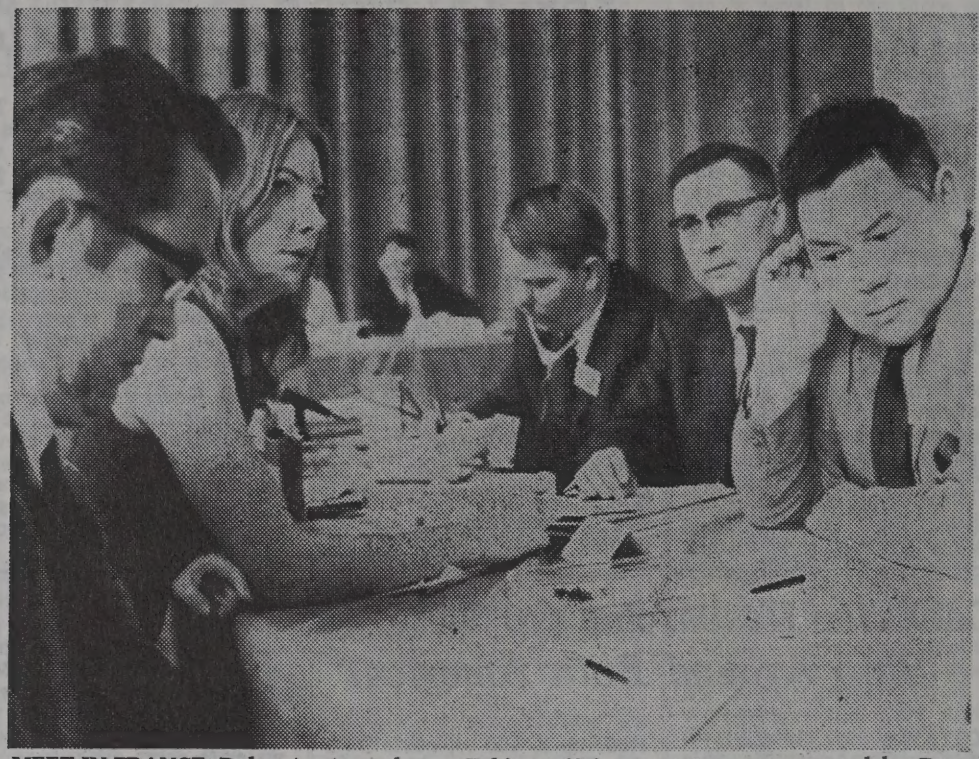
The first phase of the trip—in the south Atlantic, Antarctic and south Pacific—is designed as Canada's contribution to the International Oceanographic Decade, a 10-year program beginning in 1970 to explore the world's ocean resources. The scientists' studies in the Chilean fiords will be compared to results from studies of similar waters on the British Columbia coast and elsewhere.

COAST GUARD NAMES CUTTERS FOR HEROES

WASHINGTON—The United States Coast Guard's newest 378-foot cutters will be named after Coast Guard heroes. Previously they had been named in honor of former Secretaries of the Treasury, a custom traditional with the Coast Guard since 1830.

The first names of heroes selected for the next three 378-foot cutters are "Munro," "Jarvis" and "Midgett."

The Jarvis will be named for Capt. David H. Jarvis, winner of a special Congressional Gold Medal of Honor for leading a three-man expedition to save 500 starving men at Point Barrow, Alaska, in the winter of 1897-98.



MEET IN FRANCE: Delegates to parley on Eskimo affairs. Meetings, sponsored by French Foundation of Nordic Studies, were held in Le Havre and Rouen.

Grim Talks Held on Eskimos' Future

By JOHN L. HESS
The New York Times

ROUEN, France, Nov. 27 — Eskimos and an assortment of specialists about their way of life closed today a grim discussion of the chances for survival of the Eskimo culture.

They did not agree on whether a culture shared by 80,000 people scattered about the Arctic Circle could long persist in the face or modern development. But there was general acknowledgment that the Eskimos were more victims than beneficiaries of that development.

The conference, attended by 20 Eskimos from Alaska, Canada and Greenland and by 45 non-Eskimo specialists, divided its time between the concrete tundras of Le Havre and Rouen, the site of the sponsoring French Foundation of Nordic Studies.

Although an expected Soviet delegation failed to appear, delegates said the meeting was the broadest international meeting of and about Eskimos yet held. Other countries represented, besides France, were Denmark, Britain, Canada and the United States.

Studies delivered here indicated that the Eskimos were losing their livelihood as hunters and fishermen and, unable to fill many of the new jobs opening up, were overwhelmingly dependent on government help. Despondency and alcoholism also marked their condition.

Deep differences arose, however, among those delegates who favored preserving the hunting-and-fishing society and its language, and those who would assimilate the Eskimos into the modern world until they disappeared as a separate entity.

Largely in favor of saving the Eskimo culture were the Alaskan delegation, French and French-Canadian ethnologists and missionaries and young Eskimos from Greenland. Danish and Eskimo officials from Greenland and federal Canadian officials leaned toward assimilation.

State Representative William L. Hensley of Kotzebue, president of the Alaska Federation of Natives, found an international platform here for the demand of Eskimos and Indians to share largely in the oil found under their old hunting grounds. There are 55,000 Eskimos, Indians and Aleuts in Alaska.

Canadian spokesmen insisted that their country would never allow the bulk of the new oil wealth to go to the country's 15,000 Eskimos.

Allon R. Tussing, a specialist in development from Anchorage, Alaska, retorted: "Unearned income is considered a disgrace for the unemployed but quite moral for the rich." He challenged the idea that "it is doing a favor to Eskimos to prepare them for proletarian jobs—which are not available anyway."

Answering the objection of officials of Greenland to the teaching of the Eskimo language in schools, Mr. Tussing questioned whether the Danish language was an adequate substitute.

Although Denmark has long been regarded as a leader in the aid and rights accorded the native population of Greenland, Eskimos repeatedly cited examples of economic inferiority.

Prof. Jean Mallaurie of the Sorbonne, the head of the foundation that sponsored the meeting, led the argument for preserving the Eskimo language and the hunting society. He argued on the ground, popular in French ethnology, that different cultures are equally valid.

Other proposals, put forward informally at the fourth annual Congress on Arctic Development and the Future of Eskimo Societies, called for the maintenance of the Eskimo language as a matter of human rights, for the use of audio-visual aids to teach it, for price support for furs, for a curb on the slaughter of seals, for the establishment of an air route linking the Eskimos from Greenland to Alaska and for a permanent secretariat to watch the development of the Eskimos.

Prof. George W. Rogers, a sociologist at the University of Alaska, commented at the end of the four-day-meeting: "What's come out of this is that Eskimos are people. The anthropologists want to keep them apart and study them, the politicians want to use them, the big companies want to exploit them or ignore them. Suddenly, they're appearing here, militant, and against all the cliches."

ESKIMO LIFE ERODED BY APATHY IN CANADA

CHESTERFIELD INLET, Northwest Territories (Canadian Press)—A Roman Catholic missionary who has lived among the Eskimos for 37 years says "the life they lead now is a superficial one—they are hanging by a very thin thread."

The Rev. Peter Henry was talking in an interview about Eskimos who live at small northern posts.

Father Henry said he believes the Government should help them but "in their way."

"The seasons were always too short" Father Henry said. They were so happy. Now they are no longer tied to their families; they are tied to the Department of Northern Affairs.

"They say: 'Why should we pray or hunt for food, we can get it from the D.N.A.'

"Now there is only apathy; they have nothing to strive for and are losing their reason for being alive."

If they are cut off welfare for any reason, Father Henry added, only the older generation of Eskimos will survive. The younger generation should be encouraged to learn the old ways as well as the new, he said.

Alaskan Population Count Shows Wide Open Spaces

JUNEAU, Alaska (AP)—Alaskan natives — Indians, Eskimos and Aleuts — comprise about 19 per cent of the state's population.

Military personnel account for about 12 per cent of the state's population of just under 280,000, with the remaining 69 per cent constituting the non-active civilian population.

In the latest census, the United States had an average population density of 60 persons per square mile. In Alaska, the average density was only four-tenths of one person per square mile, roughly equivalent to the density in the American West of a century ago.

Copter Crash In Antarctic Kills Two

Nov. 20

A former University of Wisconsin scientist and a New Zealand film director died Wednesday in the crash of a navy helicopter in Antarctica.

The five other persons aboard were injured slightly. Two survivors walked eight miles to radio for help.

The victims were Thomas E. Berg, 36, of St. Albert, Alberta, who was in the final stages of work for a Ph.D. in geology at UW, and Jeremy Sykes, 34, a New Zealand movie director.

The navy said the helicopter lost power and crashed on an icy slope, bursting into flames. The site is about 90 miles west of the New Zealand base at Scott Station.

The scientists and film makers were flying back to the base from an area known as the Petrified forest after doing work on a documentary film about the New Zealand research team in the Antarctic.

Berg, a native of Onalaska, Wis. (La Crosse county), was participating in the program through a National Science Foundation grant.

After the crash, navy Lt. Michael T. Mabry, the co-pilot, and another crewman walked five miles to a radio tent. The set failed to operate, so they hiked three more miles to another emergency radio station. There, they succeeded in contacting the American base at McMurdo Sound.

Help arrived quickly and the injured men were taken to the McMurdo dispensary. They were reported in good condition late Wednesday with minor burns.

Besides Mabry, the others injured were Donald Currie of Edmonton, Alberta, Berg's assistant; navy Cdr. James F. Brandau, the pilot, and crewmen Gordon E. Little and Claude L. English.

The navy had sent out a search and rescue aircraft about 40 minutes after the helicopter failed to make a required position report. Shortly afterward, five other aircraft joined the search. When Mabry radioed the men's position, the rescue planes were able to find the wreckage in minutes.

The crash was the first fatal aircraft accident in Antarctica since 1966, the navy said.

Berg had attended the UW ffom 1957 to 1965. As a graduate student, he served as a research assistant, project assistant and teaching assistant.

He participated in expeditions to the Antarctic in 1961 and 1964. During the 1964 exploration, Berg discovered an unusual moraine made entirely of salt. The moraine covers five square miles and is in Miers valley, an ice free gulch near the eastern coast of Victoria land. Berg was serving as project assistant to UW geology Prof. Robert A. Black, who was directing the study.

Berg recently had been working in Edmonton with the Research Council of Alberta.

Harry Ross, 78, Dies; Served on 1st Polar Sub

WASHINGTON, Dec. 14 — Harry W. Ross, 78, who braved a leaking submarine in an unsuccessful attempt to sail under the North Pole in 1931, died yesterday at George Washington University Hospital after a long illness. He lived at 5906 13th St. NW.

Mr. Ross joined British explorer Sir Hubert Wilkins on the old Nautilus in the first attempt to navigate to the North Pole. They failed when their refitted ship, buffeted by storms, began to take on water 390 miles from the polar cap.

"We had a small ship, and the waves really pounded it," Mr. Ross said in an interview in 1958, when a sub, the nuclear-powered Nautilus, successfully sailed under the North Pole.

"Water came in from the seams and we had to hang up buckets to catch it. Nobody was especially happy to turn back, but we knew we couldn't go any further.

"The water was rough, ice was setting in all around, and we were never sure that we could find our way back. The fog was terrible, and three was no radar in those days."

Born in Seguin, Tex., Mr. Ross served in the Navy during World War I on submarine and mine sweeper duty. He joined the Maritime Service in Wolrd War II and took part in the allied invasions of North Africa and Sicily.

He was a compositor when he wasn't serving in the wars or exploring the Artic. He worked for several papers in New York as well as for The Star and, from 1953 until his retirement in 1965, for the Washington Post.

Mr. Ross was the executive officer of the Nautilus, a 150-foot-long vessel which as closely resembled the Civil War Merrimac as it would today's submarines. The ship was fitted with a pair of runners resembling inverted skis to help it glide beneath the ice. It also had a drill to break through to the surface.

"Nobody knew if we'd make the Pole, or get stuck under the ice and never come up again," Mr. Ross said in 1958. "We only had a skeleton crew of 16 men, including Sir Hurbert, but they were all good."

DUNCAN STEWART, 64, GEOLOGY CHAIRMAN

The New York Times

NORTHFIELD, Minn., Nov. 8 —Dr. Duncan Stewart 7th, chairman of the Carleton College geology department and an authority on Antartic minerals, died Wednesday. His age was 64.

Dr. Stewart analyzed the rock collections made during the late Rear Adm. Richard E. Byrd's three Antarctic expeditions and later made petrographic studies of specimens from several European and American expeditions to Antarctica.

In 1960, on an invitation by the National Science Foundation, Dr. Stewart accompanied an expedition to Antarctica as a part of the United States Antarctic Research Program. A mountain in the Antarctic was named Stewart Hills in honor of his contribution to Antarctic petrography. In 1968 he received a medal from Congress for his service during the expedition.

He graduated from the University of Michigan in 1928 and received a Ph.D. degree there in 1933.

Surviving are his widow, Graziella; a son, Duncan 8th; two daughters, Mrs. Rick Anderson and Stella; a sister, Margaret W., and two grandchildren.

African Dies in Fall at Pole

PRETORIA, South Africa, Dec. 4 (AP)—A member of South Africa's 10th expedition to the South Pole fell to his death down a precipice in the Antarctic wastes 100 miles from his base at Sanae, Deputy Transport Minister Herman Martins announced today. Gordon Mackie, an unmarried mechanic, suffered fatal head and neck injuries in the fall yesterday.

A. A. THOMPSON JR., A GEOPHYSICIST, 46

Andrew A. Thompson Jr., a geophysicist who participated in the 1947 Ronne Antarctic expedition, died in Johns Hopkine Hospital in Baltimore on Sept. 17 of injuries suffered in an automobile accident Sept, 3. He was 46 years old and lived in Havre de Grace, Md., a suburb of Baltimore.

In recent years Mr. Thompson was a research geophysicist in the exploration and kinetics branch of the Army Ballistic Research Laboratories at the Aberdeen Proving Grounds in Maryland. He specialized in ground shock and seismic wave propagation.

He received his bachelor's degree in physics from Yale University in 1945 and a master's degree in geology from Columbia University. He headed the geophysical research team that accompanied Navy Commander Finn Ronne to the Antarctic.

He is survived by his widow, the former Rosalie Hunter; five sons, Andrew A. 3d, Samuel R., Alfred Hunter, Daniel G. and Barton A.; a daughter, Virginia C.; three sisters, Mrs. James H. Austin, Mrs. Henry G. Thorndike and Mrs. Sherwood C. Martin, and two brothers, Josiah and Gilbert.

Fannie Siple Dies; Mother Of Explorer

CANTON, Ohio, Oct. 27 Mrs. Fannie H. Siple, 92, mother of the late Anarctic explorer Dr. Paul A. Siple, died unexpectedly Saturday night in Timken Mercy Hospital.

Dr. Siple, who made his first trip to the Anarctic as an Eagle Scout with Rear Adm. Richard E. Byrd, probably knew more about the region and had been there more times than any other man, was an adviser to the U.S. Government at the time of his death last year.

Mrs. Siple is survived by a daughter, Mrs. Lester Kettering of Canton. She was preceded in death by her husband, Clyde L. Siple.

Tourism Up in North Canada

HAY RIVER, Northwest Territories (AP)—Tourism in Canada's Far North has grown in the last 10 years from 600 visitors spending $350,000 to 9,000 spending $3-million, the territorial government reported.

Group collecting ice samples near the ship led by Guenther Frankenstein, without parka, a U.S. Army ice physicist

The New York Times (by William D. Smith)

The tanker Manhattan plowing through pack ice during trip through Northwest Passage to North Slope oil fields. Ice like this comes all the way to Alaskan shore in winter and is one of the major obstacles for mooring future tankers.